THE IRON TRADE REVIEW

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VERY BUSY

ARE THE FINISHING MILLS IN ALL PARTS OF THE COUNTRY.

Demand for Billets Far Exceeds Supply—Pig Iron Selling Steadily and the Market is Firm.

The week has been one of quiet strength. While there have been no sensational features, and the pig iron market has not displayed the activity of two weeks ago, there is no basis for anything except a very hopeful view.

New Record for Ore Shipments.

Shipments of ore from the Lake Superior ranges in June were within 550 tons of 5,000,000. The reports for July are not yet complete, but the shipments from the head of the lakes are more than 200,000 tons in excess of those for June, and it seems certain that the total shipments will exceed 5,000,000 tons. In view of the fact that heavy rains have interfered with the operation of many mines, especially on the Mesabi, this showing is indeed remarkable. There is increased inquiry for ore on the part of furnaces and sales are being made daily. The buying of ore early in the season was so heavy that many furnaces which find they have not covered for their requirements will have difficulty in getting what they want, as unsold, high grade ores are very scarce.

Steady Selling of Pig Iron.

The selling of pig iron has continued steadily in nearly all centers, and sales aggregate a large tonnage, although they are made up for the most part of small orders. In the Cleveland district sales aggregating nearly 50,000 tons of all grades have been made within a week and prices are firm. Among the sales made by a Cleveland company were about 6,000 tons of malleable at $14.50, Valley. While it is still possible to buy foundry iron at $14.00 for No. 2, Valley, many furnaces are holding for $14.50 and are not willing to sell below that price except in small lots for immediate delivery. The demand for Bessemer pig iron in the Chicago district has been so strong that three or four furnaces, which have often made foundry grades, have been producing Bessemer for some time Two new furnaces to run on foundry iron for the Chicago district are to be built this year. The scarcity of foundry iron in that district is shown by the fact that the prices of local foundry irons are nearly $1.00 higher than those for Southern. The rapid advance in the quotations of Southern irons has had marked effect in all centers in checking the buying, but sellers are not disposed to go below $12.00, and arrangements are being made for a considerable increase in the product of Southern furnaces at an early date.

Strong demand for Shapes.

In finished lines the pressure on the mills for structural materials is constantly increasing, and many plants cannot promise delivery any time this year. The recent increase in the demand for light rails has resulted in an advance in price of $1.00 per ton. There is still much cutting in the price of sheets, but the demand is improving and in some places the store trade is unusually active. The demand for bar iron is improving.

Scrap Shows Improvement.

After a period of prolonged depression the scrap market is showing signs of improvement, and, although in some places the strength is speculative, prices are firmer and buyers are showing more interest.

SECOND FURNACE

Will be Built at Mayville, Wis., by the Northwestern Iron Co.

CHICAGO, Aug. 2.—The Northwestern Iron Co. will commence at once the construction of a second furnace at its Mayville, Wis., plant, in which Pickands, Brown & Co., of Chicago, are largely interested. It is expected the furnace will be ready for operation within twelve months. It will have a capacity of about 200 tons per day, for while the most modern designs will be consulted in its construction, the practice as represented here is to avoid large furnaces. The Mayville plant possesses a large quantity of iron ore adjacent to the furnace, of which it uses from thirty to fifty percent, according to the grade to be produced. It is also said that the new furnace which Pickands, Brown & Co. announced some weeks ago would be built at Chicago, will be commenced soon, and that it, too, will be finished within a year. Besides these two assured additions to the furnaces of Chicago, one or two others are in contemplation, with fair chances that they may be undertaken in the near future. These enterprises indicate a scarcity in this market that will by their completion be at least partially remedied.

Strong Demand for Rails.

(Special Telegram.)

New York, Aug. 2.—The demand for rails is excellent. Among sales this week were: Galveston, Harrisburg and San Antonio railroad, 3,000; Kansas City Southern, 12,000; Atchison, Topeka and Santa Fe, 12,000; B. & O., 2,000; Los Angeles railroad, 5,000; miscellaneous, 10,000 tons.

MOLDERS GOING TO WORK.

The Manufacturers' Association of Pittsburg has as yet taken no official action in regard to the molders who have demanded a minimum of $3.20 per day of nine hours. The members of the union have demanded a $3.20 minimum where their agreement is signed and $3.30 per day where their agreement is not signed. Rather than sign the agreement many members of the employers' association have agreed to pay $3.30 and the present indication is that there will not be a strike, as the men are working in nearly all foundries.

THE WEEK IN IRON CENTERS.

PITTSBURG.

Scarcity of Billets a Prominent Feature—Pig Iron Quiet.

OFFICE OF *The Iron Trade Review*,
521 PARK BUILDING, August 2.

The condition of the general market in this district continues strong, although the demand for pig iron, noticeable for the past few weeks has settled down and the sales are for small tonnage, none over 500 tons being reported. Northern iron advanced another 25c and souhern producers are asking $12 for No. 2 Birmingham.

Inquiries for billets and sheet bars are being turned down, as the steel works have all they can handle now on the books. Some of the big producers are themselves in the market for billets and one large interest has an arrangement whereby it is exchanging scrap to meet its own requirements. For billets $25 per ton has been offered and rejected on account of inability to handle the orders.

In structural iron and other finished products, business has been booming, and it is impossible to secure material for prompt delivery. With pig iron the strength shown during June and July, usually dull months, is looked upon with optimism and heavy business is looked for during the remainder of the year. The fact that buying took a spurt and then settled down to ordinary business is not looked upon as unusual. It has acted as a stimulant for the mid-summer season.

Pig Iron.—Buying has been light in this market during the past week and there are no unusual features, although the situation is strong, and better business is expected toward the close of the present month: We revise quotations as follows:

Bessemer, Valley	$14 50 to 14 75
Bessemer, Pittsburg	15 35 to 15 60
No. 1 Foundry	15 85 to 16 10
No. 2 Foundry	15 35 to 15 60
Gray Forge, Pittsburg	14 35 to 14 60
Basic, Valley	14 60 to 14 85
Basic, Pittsburg	15 10 to 15 35

Steel.—Consumers are finding considerable difficulty in placing their orders, as most of the producers have sold up to their capacity for the remainder of the year on expected to develop a shortage. Bars, long lengths, are sheet bars, and independent sheet and tin plate mills are quoted at $25 and cut bars at an advance of 50c. Bessemer and open hearth billets are firm at $23.

Ferro-Manganese.—In carload lots foreign manganese, 80 percent has sold for $49, Pittsburg.

Muck Bar.—Very little business has been done and last week's quotation, $26.25, Youngstown, is the only price.

Skelp.—As most of the mills are idle, the market is quiet. We quote Bessemer grooved at 1.50c and sheared at 1.55c. Open hearth is quoted at an advance of $1 per ton. Grooved iron is quoted at 1.55c and sheared 1.60c to 1.65c.

Rails and Track Material.—Demands for light rails have increased, and with Jones & Laughlin Steel Co., Cambria and Cumberland busy on bars, the scarcity has created much of the demand and made the higher prices.

Quotations are unchanged as follows: Fifty lb. and over 500 tons, $28; car lots and less than 500 tons, $30; less than car lots, $32; light rails, 16 lb., $27 to $28; 20 lb. $26.50 to $27; 25 to 45 lb., $25 to $26; angle bars for standard sections, 1.25c; spikes, 1.70c.

Plates.—Early deliveries are hard to secure. On both wide and narrow plates the mills have orders which will keep them busy for several months, and were it not for the agreement not to ask premiums they could easily be secured. We quote:

Tank plates, ¼ in. thick, 6¼ in. to 14 in., inclusive, 1.50c f. o. b. mill Pittsburg; over 14 lb.: Flange and boiler steel, 10c; marine, A. B. M. A., and ordinary fire box, 20c; still bottom, 30c.; locomotive fire box, 50c; plates over 100 in. up to 110 in. in width, not less than 5c extra; plates 110 in. to 115 in. wide, not less than 10c extra; 115 to 120 in., 15c extra; plates 120 in. to 125 in. wide, not less than 25c extra; plates 125 in. to 130 in., not less than 50c extra; plates 130 in. wide, not less than $1 extra; plates 3-16 in. thick, 10c extra; gauges 7 and 8, 15c extra; No. 9, 25c extra. Five cents extra for less than carloads. Terms net cash in 30 days, and for all points of delivery in the United States except Pacific Coast.

Bars.—While several large contracts have been taken for delivery during the remainder of the year, producers have shown a tendency to contract only for three months' delivery. Bar iron continues firm at 1.60c to 1.65c, Pittsburg. We quote as follows:

Bar iron 1.60c to 1.65c Pittsburg; hoops 1.65c, and bands, 1.50c, both taking hoops and band extras respectively. Bessemer steel bars, 1.50c.; open-hearth steel bars, 1.50c.; plow and cultivator, 1.50c, net; channels, angles, zees and tees, under 3 in., 1.65c. The following differentials are maintained on steel: Less than 200 lb. of a size and not less than 1,000 lb., 10 cents advance; less than 1,000 lb. of a size, 30 cents advance.

Structural Material.—While quotations continue unchanged, the business now on the books is enormous, and structural mills are almost overwhelmed, some companies carrying more than ever before in their history.

Quotations are unchanged as follows: Beams and channels up to 15 in., 1.60c; over 15 in., 1.70c; angles, 3 x 2 up to 6 x 6, 1.60c; zees, 1.50c; tees, 1.65c; angles, from 3 to 16 in., 1.60c; universal and sheared plates, 6¼ to 14 in., inclusive, 1.50c; over 14 in., 1.60c base.

Sheets.—Independent sheet mills are ready and anxious to accept business on desirable carload lots at 2.30c for No. 28, but there does not seem to be much business ness for anybody. We quote:

No. 30, 2.70c to 2.75c; No. 29, 2.60c to 2.65c; No. 28, 2.30c to 2.35c; No. 27, 2.20c to 2.25c; Nos. 25-26, 2.20c; Nos. 23-24, 2.15c; Nos. 18-20, 2.10c; No. 16, 2.10c; Nos. 12-14, 2.05c; No. 9, 2c; No. 8, 1.95c; Galvanized No. 30, 4.30c; No. 29, 3.80c; No. 28, 3.40c; No. 27, 3.20c; Nos. 25-26, 3c; Nos. 23-24, 2.80c; Nos. 18-20, 2.65c; No. 16, 2.50c.

Wire and Wire Nails.—The mills have not yet started, although they are expected to resume later in the month to make stock for the fall demand.

We quote: Wire nails, jobbers' carload lots, $1.80; retailers' carload lots, $1.85, and less than carloads, $1.95; painted barb wire, $1.95 for jobbers in carloads; retailers' carloads, $2, and less than carloads, $2.10, with 30c for galvanizing. Annealed smooth fence wire is held at $1.65, with the usual differentials to retailers for carloads and less than carloads. Quotations are all f. o. b. Pittsburg, 60 days, with 2 percent discount for cash in ten days. Iron and steel cut nails, $1.70 to $1.75.

Merchant Steel.—This market continues without change.

We quote: Cold rolled and ground shafting, 50 percent off in carload lots, and 45 off in less than carloads, delivered in base territory; open-hearth spring steel, 2.25c to 2.50c; sleigh shoe flat, 1.50c to 1.55c; smooth finished machinery steel, 1.70c to 1.75c; toe calk, 2c to 2.05c.

Pipe and Tubes.—The concession of three points made by the independent mills on the official list still holds

good and is being met where necessary. The volume of business has increased slightly. Discounts to consumers, carload lots f. o. b. Pittsburg, plus freight to destination, Tube Rate Book are as follows:

	Steel.		Iron.	
	Black.	Galv.	Black.	Galv.
⅛ and ¼ inch	67	51	65	49
⅜ to 6 inches	75	65	73½	63½
⅜ and ½ inch	71	59	69	57
7 to 12 inches	70	55	68½	53
EXTRA STRONG PLAIN ENDS.				
⅛ to ¼ inch	60	48	58	46
⅜ to 4 inches	67	55	65	53
4½ to 8 inches	63	51	61	49
Double extra strong plain ends, ½ to 8 inches	56	45	54	43

MERCHANT BOILER TUBES, CARLOADS, 22 FEET AND UNDER.

	Steel.	Iron.
1 to 1½ inches	44	41
1¾ to 2½ inches	56	41
2½ inches	58	46
2¾ to 5 inches	64	53
6 to 13 inches	56	41

Less than carloads 2 points less.

Old Material.—The deadlock of the past few months still continues. One big concern is exchanging scrap for steel, but sales have been unimportant. We quote, gross tons, as follows:

Heavy melting stock, $14.00 to $14.25; low phosphorus material, $17.50 to $18.00; rerolling rails, $14.00 to $14.25; cast scrap, $13.00 to $13.25; borings, $8.25 to $8.50; No. 1 Wrought $14.50 to $14.75.

Coke.—Furnace coke for spot delivery, is quoted from $1.75 to $1.90, depending upon quality. Foundry coke is quoted at $2.25 to $2.40, although some higher prices have been secured.

CHICAGO.

Buying of Pig Iron Not So Active—Bright Prospects for Rails.

OFFICE OF *The Iron Trade Review*,
1164 MONADNOCK BLOCK, August 2.

The great activity in pig iron noted a week ago has in a large measure subsided. Trade is not back to the previous dullness, but as compared with the voracious buying, there is marked decline. Prices are holding firmly at the advanced levels, but no one seems disposed to ask more than $12, Birmingham, for No. 2 foundry, and if any one is offering it at less, the instances are isolated. Some melters say they can buy at $11.75, but quotations at that figure are believed to be stale, though possibly for one reason or another some might be honored. So, too, are northern irons firm at the 50 cent advance they have recorded.

The situation in intermediate and finished iron and steel grows stronger. The consumptive demand in the west gathers in intensity. To the previously stated circumstance that sheets are an exception, there might be made this week this qualification, that the inquiry is very heavy. Buying is steady, but there is a lot of requirements, which the inquirers hesitate to provide for, because of the raggedness of quotations. Store trade, not only in sheets, but all forms of mill product, is more than usually active for midsummer. One of the local iron and steel jobbing houses one day last week booked over 350 orders, the largest day's work in the history of the company. The number of orders shows the metal is moving in many streams to the numerous consumers. Some jobbing stocks which by the inventory of July 1 were regarded as large, have been seriously crippled by the shipments of last month. Eastern structural mills are not promising deliveries on new business before the first quarter of 1906, and some of the smaller mills that a month ago could accept orders for relatively prompt delivery are putting the date of shipment farther ahead. There is moderate improvement in the inquiry for merchant pipe and orders for wire and nails are foreshadowing an active August trade. Some additional gains have been made in scrap, but the strength here is more speculative and sympathetic, than created by increased demand from consumers.

Pig Iron.—The Chicago market for local pig iron is swayed as often by a change in the tonnage accessible as by the variations in the foundrymen's needs. When the steel mills run full time the product of three or four furnaces is diverted from foundry to Bessemer grades and to that extent the foundryman is left in the lurch. Of this intermittent type are the two South Chicago furnaces of the International Harvester Co. and the two Bay View furnaces of the Illinois Steel Co. It is for the purpose of rectifying this fluctuation, or of modifying its effects that the two new furnaces will be erected this year in the Chicago district. Both will run on foundry irons. The relative scarcity of local foundry irons at present, as compared with southern product, is shown by the higher prices of the former. They are now nearly a dollar higher than Southern and recently have hung steadily at more than a dollar higher. The partial cessation in the inquiry for pig iron naturally follows the previously excessive purchases. Few, if any, orders have been placed here for larger than a thousand tons each within the past week. A Michigan car works bought a thousand tons of Southern No. 3 and one or two other transactions for a similar tonnage were closed. There have been a greater number of sales of 500 tons and the aggregate for smaller lots makes up a fair week's trading. Some of this business was closed at outstanding quotations, but the market is now steady at $12, Birmingham, for No. 2. While there are on the whole ample stocks of iron in the south, some of the principal producers have their stocks broken, the higher grades having disappeared and early shipments being no longer accepted. The activity in malleable Bessemer, which was the more prominent towards the close of the two weeks' buying movement, has about ceased, inasmuch as the malleable foundrymen have now pretty generally covered their needs for at least several months. Some other foundrymen are expected to renew the buying either this month or in September. One large selling agency notes the fact that at least forty or fifty percent of the melters must enter the market within that period. Malleable Bessemer is stronger, but otherwise the market is without quotable change, as follows:

Lake Superior charcoal	$17 50 to 17 75
Northern Foundry No. 1	17 00 to 17 25
Northern Foundry No. 2	16 50 to 16 75
Northern Foundry No. 3	16 00 to 16 25
Northern Scotch Foundry	17 00 to 17 25
Ohio Strong Softeners No. 1	17 30
Ohio Strong Softeners No. 2	17 80
Southern Foundry No. 1	16 15
Southern Foundry No. 2	15 65
Southern Foundry No. 3	15 15
Southern Foundry No. 4	14 90
Southern No. 1 Soft	16 15
Southern No. 2 Soft	15 65
Southern Gray Forge	14 65
Southern Mottled	14 40
Southern Silveries (4 percent to 6 percent Silicon)	16 65 to 17 65
Jackson Co. Silveries (8 percent to 10 percent Silveries)	19 80 to 20 30
Alabama and Georgia Car Wheel	20 15
Malleable Bessemer	16 00 to 16 75
Basic Iron	15 65 to 16 15

Billets.—Forging billets constitute about the whole market and they are moving in restricted lots. Large producers find no trouble in selling them at $32, which is about the top notch scored this year in this market. Quotation is nominally $28 to $30, with wire rods $32 to $34.

Bars.—Iron bars are in better demand since the recent strength developed. In the St. Louis market there was a rather sharp advance last week from 1.40c to 1.55c, and while the rise was not so sharp at Chicago, the market is broadening, inquiry increasing and prices holding at 1.55c,

though occasionally quoted higher. Following the bunch of large contracts for steel bars, closed in the earlier part of July, the contracts booked in steel are for considerably smaller tonnages this week. There remain considerable needs to be covered and the mills are losing in their race to gain upon specifications.

Our quotations are as follows: On carload lots, mill shipments, Chicago delivery: Bessemer and open-hearth bars and bands, 1.66½c base, half extras; soft steel angles, less than 3 x 3, 1.76½c; hoops, 1.81½c base, full extras. Store trade is active and prices are firm. We quote bar iron, 1.90c base, full extras; soft steel bars and bands, 1.85c to 1.95c base, full extras; soft steel angles, channels and tees, under 3 in., 1.95c to 2.05c; hoops, 2.20c base, full extras.

Sheets.—The buyer of sheets is moved by conflicting opinions. It is against his better judgment to buy freely with prices so ragged as they have been and as they are now, but his work or his own orders, if he is a middleman, compel him to buy at least sparingly and steadily. The inquiry for sheets this week, however, shows considerable increase in volume and because of them the market has a somewhat more nervous appearance. It would not take much of a shock to bring into close action a multitude of inquiries. The heavier amount of business in sight is in part sympathetic with activity in other departments, but it is believed to represent actual and early requirements. There is practically no change in quotations.

We continue to quote carload lots, mills shipments, Chicago delivery, as follows: Blue annealed sheets, Nos. 9 and 10, 1.81½c; Nos. 11 and 12, 1.86½c; Nos. 13 and 14, 1.91½c; Nos. 15 and 16, 2.01½c. On box annealed, one pass, cold rolled, we quote Nos. 18 and 20, 2.21½c; Nos. 22 and 24, 2.26½c; Nos. 25 and 26, 2.31½c; No. 27, 2.36½c; No. 28, 2.46½c; No. 29, 2.50½c; No. 30, 2.66½c. We quote on lots from warehouse stocks as follows: No. 10, 2.10c to 2.15c; No. 12, 2.15c to 2.20c; No. 14, 2.20c to 2.25c; No. 16, 2.30c to 2.35c; Nos. 18 and 20, 2.50c to 2.55c; Nos. 22 and 24, 2.55c to 2.60c; No. 26, 2.70c to 2.75c; No. 27, 2.75c to 2.85c; No. 28, 2.85c to 2.95c; No. 29, 3c to 3.05c. Galvanized sheets, mill shipments, Chicago delivery, are quoted as follows: Nos. 12 and 14, 2.46½c; No. 16, 2.61½c; Nos. 18 and 20, 2.76½c; Nos. 22 and 24, 2.91½c; No. 26, 3.11½c; No. 27, 3.31½c; No. 28, 3.51½c; No. 29, 3.76½c. Jobbers' prices on lots from store are as follows: Nos. 10 to 14 inclusive, 3.10c; No. 16, 3c; Nos. 18 and 20, 3.10c; Nos. 22 and 24, 3.25c; No. 26, 3.50c; No. 27, 3.70c; No. 28, 3.95c; No. 29, 4.40c; No. 30, 4.85c.

Structural Material.—No important new local inquiries for structural material have appeared, though a large amount of business is hanging fire. There is the possibility that the long delays, unavoidable before deliveries can be made on orders now placed, may discourage some building enterprises that would otherwise be rushed to completion this year, but, if so, the withdrawal will not be appreciably felt by the mills, for the latter are now sold up, generally speaking, to the end of the year. The large mills are accepting orders only for deliveries during the first quarter of 1906. A few offers for premiums for early deliveries have been made only to be turned down . The store trade in shapes continues remarkably active.

We quote, Chicago delivery, as follows: Beams and channels, 3 to 15 in., inclusive, 1.76½c; angles, 3 to 6 in., ¼ in. and heavier, 1.76½c; angles larger than 6 in., or one or both legs, 1.86½c; beams larger than 15 in., 1.86½c; zees, 3 in. and over, 1.76½c; tees, 3 in. and over, 1.86½c; with the usual extras for cutting to exact lengths, punching, coping, bending or other shop work. We quote prices from store as follows: 2.10c to 2.25c for angles, beams and channels, base sizes, with 2.20c to 2.30c for 18, 20 and 24-in. beams; tees and zees, 2.15c to 2.25c. These prices are for either random lengths or cut to specifications in excess of 5 ft.

Plates.—One of the local mills, that only a short time ago was making prompt deliveries is now quoting sixty days as a minimum limit. All developments point to a tightening of the difficulties in which deliveries in the plate trade are involved. Specifications at the mills are very large, and prices are firm.

We quote carload lots, mill shipments, Chicago delivery, as follows: Tank steel, ¼ in. and heavier, 6⅛ in. to 100 in., 1.76½c base; flange steel, 1.86½c base; marine steel, 1.96½c base, all full extras. Plates, 3-16 in. thick, $2 extras; gauges 7 to 8, $3 extra; No. 9, $5 extra. Less than carload lots, $5 extra. Store quotations are as follows: Tank steel, ¼ in. and heavier, up to and including 72 in. wide, 2c; over 72 in. wide up to 100 in., 2.10c; over 100 in. wide, usual mill extras, 3-16 in. up to but not including 72 in. wide, 2.10c; 3-16 in., 72 in. wide, 2.35c; flange steel, 25c extra; heads, 25c extra.

Merchant Pipe.—From the weak condition of the pipe market, compared with some other products, there is gradual recovery. The volume of orders that are placed at circular prices is increasing, which is an evidence of lessened shading in prices. However, the market is not yet buoyant and not particularly active. August starts off with a promise of better trade. We quote random lengths, f. o. b. Chicago, as follows:

MERCHANT PIPE.

	Steel.		Iron.	
	Black. Percent.	Galv. Percent.	Black. Percent.	Galv. Percent.
⅛ to ¼ inches	65.85	49.85	63.85	47.85
⅜ to ½ inches	69.85	57.85	67.85	55.85
¾ to 6 inches	73.85	63.85	72.35	62.35
7 to 12 inches	68.85	53.85	67.35	51.85

PLUGGED AND REAMED.

	Steel.		Iron.	
1 to 4 inches	71.35	61.35	69.85	59.85

EXTRA STRONG PIPE.

⅛ to ¼ inches	58.85	46.85	56.85	44.85
⅜ to 4 inches	65.85	53.85	63.85	51.85
4½ to 8 inches	61.85	49.85	59.85	47.85

DOUBLE EXTRA STRONG PIPE.

⅛ to 8 inches	54.85	43.85	52.85	41.85

Boiler Tubes.—There is a fair movement of product from store and consumption proceeds without loss if with no gain. General conditions of manufacturing activity are reflected in the boiler tube trade. Carload lots, Chcago delivery, are without change, as follows:

BOILER TUBES.

	Steel.	Iron.	Seamless.
1 to 1½ inches	40.35	37.35	53.00
1¾ to 2¼ inches	54.35	39.35	40.00
2½ inches	56.35	44.35	43.00
2¾ to 5 inches	62.35	51.35	
6 to 13 inches	52.35	37.35	Up to 4½ inches 50.50

Less than carload lots from store, as follows:

	Steel.	Iron.	Seamless Steel.
1 to 1½ inches, inclusive	40	35	42½
1¾ to 2¼ inches, inclusive	50	35	35
2½ inches, inclusive	52½	35	30
2¾ to 5 inches, inclusive	60	47½	42½

Rails and Track Supplies.—Transactions in steel rails at Chicago this week are light. They are necessarily so, because the mills are so well filled with orders for the remainder of the year. On one inquiry for 5,000 tons of standard sections a premium was offered this week, but not accepted, for the injustice it would work to previous buyers. Several roads have placed on file with mills a notation of the tonnage they will want next year, but the mills are not at present considering these feelers. It is significant, however, that if the size of the inquiries of that sort so far placed is any index, the buying for 1906 will exceed that of the present year. The western roads give notice that they will want generous tonnages. The trading in light rails has been rather brisk this week. Track supplies also are fairly active, the mills not being able to make early shipments.

We quote heavy sections, in 500-ton lots and over, f. o. b.

mill, $28; less than 500 tons to carload lots, $30; less than carload lots, $32. Light rails are as follows: 12-lb. sections, $27; 16-lb., $26; 20 and 25-lb., $25; 30, 35, 40 and 45-lb. sections, $24, all f. o. b. Milwaukee mill. Track supplies, f. o. b. Joliet mill, angle bars, 1.40c to 1.50c; spikes, first quality, 1.75c to 1.80c; track bolts, 3¼ x ¾, with square nuts, 2.40c to 2.50c per lb., with hexagon nuts, 2.55c to 2.65c.

Merchant Steel.—Consumption as gauged by the earnestness with which deliveries are asked, must be very large and the mills are hustled for better time. Some buying on future contracts is in progress, supplementing previously good contracts.

Prices are without change and we quote carload lots, mill shipments, Chicago delivery as follows: Spring steel, 2.10c; sleigh shoe, flat sizes, 1.71½c; concave and convex, 1.86½c; cutter shoe, 2.35c; smooth finish machinery steel, 1.91½c; smooth finished tire, 1.86c; plow steel, 2.20c and upward, according to quality; toe calk steel, 2.21½c. Cold rolled shafting, 50 percent off in carload lots and 45 percent in less than carload lots. Crucible tool steel, 6½c to 8c; special grades of tool steel, 13c and upwards.

Cast Iron Pipe.—Inquiry may have been stimulated slightly by the stronger pig iron market, but scarcely noticeably so. There is a continuation of moderation in the routine trade, which includes some municipal engagements of modest size. The market is firmer in tone and an early advance in quotations is anticipated. We quote carload lots, Chicago delivery, as follows: 4-in., $29; 6-in., 8-in. and 10-in., $28; 12-in. and larger, $27; gas pipe, $1 a ton higher.

Wire Products.—Chicago has been filled with salesmen for the large producer for the past week and they are going home with new ideas and with increased enthusasm, as the result of a three days' conference and love feast. They will be in time to catch the heavier inquiry which is due in August for the early fall trade of the merchants. The market is somewhat brighter in immediate outlook.

We quote carload lots as follows: Wire nails, $1.95; painted barb wire, $2.10; galvanized barb wire, $2.40; smooth annealed wire, $1.80; smooth galvanized wire, $2.10; polished staples, $2.05; galvanized staples, $2.35. Less than carload lots to jobbers are 5 cents higher than above prices. The retail trade is quoted 5 cents extra over the foregoing on carload lots, and 10 cents extra on less than carload lots. Bale ties are unchanged at 82½ and 5 percent to dealers on mixed car lots and 85 percent discount f. o. b. Waukegan, Ill., on straight carload lots.

Coke.—The Semet Solvay Co., Syracuse, N. Y., has asked prices for smokeless coal to be delivered at the rate of 10,000 tons per month to the plant under construction at South Chcago, deliveries to begin Aug. 1. The entire inquiry will not be needed perhaps by that date, but during the early winter this new factor in the Chicago coke market will be producing 6,000 to 8,000 tons of coke per month, if not more. The coke market is firm at previous quotations. Connellsville furnace coke is held at $2 to $2.10 ovens, while 72-hour foundry coke is quoted $2.40 to $2.50 ovens. Wise county, West Virginia, grades are being offered from $2.40 to $2.50 ovens also.

Old Material.—Prices of old material are higher, though the speculative fever among dealers is said to be losing some of its force. Authorities on stocks at consuming plants say they are large. This would account for the mild interest of consumers in the market. Most if not all of them will purchase—at their own prices, but commonly a dealer quoted above him. That prices are relatively too high is indicated by some quotations on pig iron heavy cast scrap this past week. Foundrymen were asked practically what they would have to pay for pig iron on the $12 Birmingham basis. Quotations as revised are as follows:

Old steel rails (4 feet and over)	$14.00 to 14.50
Old steel rails (less than 4 feet)	13.50 to 14.00
Old iron rails	18.50 to 19.00
Relaying rails, subject to inspection	23.00 to 24.00
Heavy melting steel	14.00 to 14.50
Mixed country steel	11.00 to 11.50
We quote as follows net tons:	
No. 1 R. R. wrought	14.75 to 15.00
No. 2 R. R. wrought	13.75 to 14.00
Shafting	15.00 to 15.50
Dealers' forge, No. 1	11.00 to 11.50
Wrought pipe and flues	11.50 to 12.00
No. 1 cast, 150 lb. and less	13.50 to 14.00
No. 1 mill	9.00 to 9.50
No. 1 Busheling	10.00 to 10.50
No. 2 Busheling	9.00 to 9.50
Country sheet	7.50 to 8.00
No. 1 boilers, cut	10.00 to 10.50
Boiler punchings	13.50 to 14.00
Iron car axles	21.00 to 21.50
Steel car axles	16.00 to 16.50
Iron axle turnings	10.50 to 10.75
Cast borings	8.00 to 8.50
Mixed borings, etc	8.00 to 8.50
Machine shop turnings	10.00 to 10.50
Railroad malleable	12.50 to 13.00
Agricultural malleable	12.00 to 12.50
Stove plate and light cast scrap	10.00 to 10.50
Old iron splice bars	16.50 to 17.00

CINCINNATI.

Rapid Advance in Prices of Southern Pig has Checked Buying.

August 2.

Pig Iron.—The market the past week has been quiet and there is every indication that the rush of buying has subsided. The action of the southern furnaces in advancing prices had, it is generally believed, the effect of stopping order-placing sooner than would have been the case had the advance not been so rapid. Even now the market is unsettled and we learn of occasional sales on the basis of $11.50 Birmingham for No. 2 Foundry, although strictly Birmingham irons are held at $12.00 and most Northern Tennessee and Alabama irons are quoted at $11.75. Southern Ohio furnaces are generally quoting $14.00 furnace for No. 2 Foundry and this is probably minimum. There have been but few important sales during the week and there is not much inquiry. Gray Forge for prompt shipment is still in ample supply and is obtainable at about $10.25 Birmingham. A large consumer in the Pittsburg district is reported to have purchased about 4,000 tons of prompt shipment gray forge at this figure. Jackson Co. 8 percent silvery is in fair demand and steady at about $17.00 at furnace. Now that the buying movement has practically terminated, the trade is endeavoring to arrive at a conclusion as to the relation of supply and demand. It is generally believed that buyers' wants for the third quarter of the year are now well covered and that a fair proportion of the purchases for third quarter delivery will be extended into the fourth quarter, although at present buyers are calling for iron on their contract. It is believed that Southern furnaces still have practically all of the fourth quarter production unsold, although the third quarter output seems to be closely disposed of. Northern furnaces (Valley furnaces not included) still have a large proportion of their current production to sell, with but few exceptions. If the situation is correctly presented above, it is but natural that new business would be light for the remainder of the third quarter of the year, but it is generally believed that the situation is in buyers' favor, although sellers may sustain prices for some time on southern irons. Northern irons have not advanced in proportion to the southern, and being thus at an advantage over southern irons in most of the northern territory, it would seem reasonable that their present quotations could be maintained. We quote f. o. b. Cincinnati:

Southern Foundry No. 1	$14.75 to 15.25
Southern Foundry No. 2	14.25 to 14.75
Southern Foundry No. 3	13.75 to 14.25
Southern Foundry No. 4	13.50 to 14.00
Southern Foundry No. 1, soft	14.75 to 15.25

Southern Foundry No. 2, soft	14.25 to 14.75
Gray Forge	13.00 to 13.75
Northern Foundry No. 1	15.65 to 15.90
Northern Foundry No. 2	15.15 to 15.40
Northern Foundry No. 3	14.65 to 14.90
Jackson County Silvery, 8 percent	18.15

Finished Material.—The demand for structural steel continues active and plates are also in good request. Sheets remain quiet and unchanged. There is an improved demand for bar iron and the market shows an advancing tendency which is assisted by the recent advance in pig iron. Bar iron is quoted at 1.60c to 1.65c; steel bars at 1.63c, half extras, with dealers quoting 1.85c for iron and steel out of store. Galvanized sheets at 75 and 7½ percent off. We quote black sheets, No. 27 at 2.40c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.70c; No. 27, 2.60c; No. 16, 2.20c; No. 14, 2.10c; No. 12, 2.05c; No. 10, 2c. Tank plates are firm and sell out of store at 2c for ¼ in. and 2.16c for 3-16, No. 8 and No. 10. Beams and channels are quoted at 2c from stock and angles at 2c to 2.05c. for base sizes.

In merchant pipe the market holds steady and unchanged. We quote f. o. b. Cincinnati:

MERCHANT PIPE.

(Basing Discounts.)

	Steel Pipe.		Guaranteed Wrought Iron Pipe.	
	Black.	Galv.	Black.	Galv.
	Percent.	Percent.	Percent.	Percent.
⅛ and ¼ inches	65.35	49.35	63.35	47.35
⅜ and ½ inches	69.35	57.25	67.35	55.35
¾ to 6 inches	73.35	63.35	75.85	61.85
7 to 12 inches	68.35	53.35	66.85	51.35

Old Material.—There has been more trading the past week and the market is firm at quotations. We quote f. o. b. Cincinnati:

Old No. 1 railroad wrought, net tons	$14.00 to 15.00
Cast machine and foundry, net tons	12.00 to 13.00
Old iron rails, gross tons	18.50 to 19.00
Old steel rails, gross tons	14.00 to 14.50
Old short lengths, gross tons	13.50 to 14.00
Old iron axles, net tons	20.00 to 21.00
Stove plate, net tons	8.50 to 9.00
Wrought turnings, net tons	9.00 to 10.00
Cast borings, net tons	7.50 to 8.00
Car wheels, net tons	13.50 to 14.00

Coke.—The demand continues fairly good and Virginia furnace coke is scarce and wanted. We quote foundry coke at $2.25 to $2.40 f. o. b. Connellsville.

CLEVELAND.

Ore Shipments for July Will Exceed Five Million Tons—Large Pig Iron Sales.

OFFICE OF *The Iron Trade Review*,
BROWNING BUILDING, August 2.

Iron Ore.—Complete statistics of ore shipments for July are not yet available but reports received indicate that the movement will be larger than that for June, which was 4,999,450 tons. Shipments from Duluth last month were 1,048,917 tons, against 1,379,491 in June; from Two Harbors, 1,231,326 in July and 1,138,796 in June, and from Superior 932,626 in July, against 730,435 in June, making a total of 3,248,722 in June, a gain of 224,147. Ashtabula Harbor was the first port on the Great Lakes to reach the million ton mark in receipts of iron ore in one month and, incidentally, the accomplishment of this much coveted honor raises the world's record another notch. In May, 1905, Ashtabula established a record for all harbors by receiving 914,041 tons of ore. In June that harbor received 952,674, tons and the figures for July are 1,053,793 tons. With the 78,748 tons unloaded there in May, the total for the season to Aug. 1 is but 564 tons short of the 3,000,000 mark. Conneaut, which was the banner ore-receiving port in 1904, has received to date this season, 2,355,358 tons.

Recently there has been considerable inquiry for ore. Furnace operators, seeing a prospect of great activity of stocks during the next six months, are calculating on their probable ore requirements, and in not a few cases are finding that it will be necessary to supplement their previous contracts. High-grade ores, especially Bessemers, are scarce, and those who come into the market this fall will be compelled to take the leavings, which will be far from choice in many cases. Owing to the heavy rains this summer ore has been and still is very wet, and furnaces are paying for considerable water.

Pig Iron.—Buying has continued steadily and the market is firm. Within the past week very nearly 50,000 tons of pig iron has been sold by Cleveland interests, although not all of it was for consumption in this district. We note the sale of 6,000 tons of malleable at $14.50, Valley. Founders are exceptionally busy, and many are anxious to contract for the second half and a few are inquiring for the first quarter of next year. While it is easy to buy at $14.00, Valley, for No. 2 for prompt shipment, furnaces are not, as a rule, anxious to sell for the second half at that price, but are asking $14.50. The demand for Bessemer and basic is not strong. We quote f. o. b. Cleveland as follows:

Bessemer	$15.35 to 15.60
No. 1 Foundry	15.75 to 15.50
No. 2 Foundry	15.00 to 15.25
No. 3 Foundry	14.75 to 15.00
No. 2 Southern	15.60 to 15.85
Gray Forge	14.25 to 14.50
Gray Forge, Southern	14.75 to 14.75
Lake Superior charcoal	16.25 to 16.50

Finished Material.—The demand for nearly all lines is very strong, but tonnage of new orders is not as heavy as last week. Sheets are still apparently an exception, and in them competition continues active. The demand for billets is heavy and buyers are having much difficulty in placing orders. Bar iron shows some improvement, the usual quotation now being 1.55c to 1.60c at the mill. The Cleveland mills are well supplied with orders. Some sales of light rails have been made and the price has advanced $1.

Old Material.—The market is stronger, with prices advancing on nearly all kinds of scrap. We quote for Cleveland delivery:

Old iron rails	$19.50 to 20.50
Old steel rails (over 6 feet)	15.00 to 16.00
Old steel rails (under 6 feet)	15.00 to 16.00
Old car wheels	15.00 to 15.50
Steel boiler plate	10.50 to 11.00
Steel axles	16.50 to 17.50
Malleable iron (railroad)	14.00 to 15.00
Malleable iron (agricultural)	13.00 to 13.50
Heavy steel	15.00 to 15.50

We quote as follows, net tons:

No. 1 R. R. wrought	14.00 to 15.00
No. 1 busheling	12.50 to 13.50
No. 1 machine cast	12.50 to 13.00
Iron axles	19.00 to 20.00
Axle turnings	10.00 to 11.00
Wrought turnings (free from cast)	9.00 to 10.00
Grate bars	7.50 to 8.50
Pipes and flues	10.00 to 11.00
Tank iron	8.50 to 9.50
Hoop and band iron	7.00 to 8.00
Sheet iron	6.00 to 7.00
Wrought drillings	9.50 to 10.50
Stove plate	9.50 to 10.00
Cast borings	7.50 to 8.50

J. F. Corlett & Co., jobbers in iron and steel, have moved from the Perry-Payne building to 1320-1324 Rockefeller building.

NEW YORK.

Market Quiet for All Grades of Iron—Continued Urgent Demand for Structural Steel.

OFFICE OF *The Iron Trade Review*,
ROOM 1315, No. 150 NASSAU ST., August 2.

Pig Iron.—In comparison with that of the week before last, when sales exceeded a total of 100,000 tons, the market for all grades of pig iron became very quiet last week, the

aggregate transaction not passing beyond 30,000 tons. At present there is little more than an order trade for both Southern and Northern iron. Orders for the week have been small, mainly for Northern and Virginia foundry iron. Some little demand has developed for gray forge, presumably to be used instead of scrap. This morning the market showed a little more strength than for the past week, one furnace representative finding no difficulty in disposing of 500 tons of New York State iron at $15.50 furnace, and a like amount of Virginia foundry at $14 and $14.50. There is but little inquiry for basic or Bessemer in the eastern market. Of the total tonnage placed during the week, probably not more than one or two thousand tons were for other than foundry grades. Consumers are buying steadily to supply immediate demands. This, together with the prevailing firmness in prices, seems to indicate that the situation is not without strength.

Northern No. 1 Foundry	$16.00 to 16.50
No. 2 Foundry	15.75 to 16.25
No. 2 Plain	15.25 to 15.50
No. 1 Southern Foundry	15.25 to 15.75
No. 2 Southern Foundry	14.75 to 15.25
No. 3 Southern Foundry	14.25 to 14.75
No. 4 Foundry	14.00 to 14.50

Finished Iron and Steel.—The demand for structural steel remains urgent. The condition is shown in the reported sale of 1,000 tons of second hand material at 2.5 cents for immediate delivery, and other sales at only slightly lower prices for prompt shipment. A very large tonnage of business is pending and the many small current orders make up a considerable aggregate. The contracts for the material for the Manhattan bridge continue until next week to be a subject for speculation and rivalry. The contract for the steel for the building of the engineering societies has been awarded by the Wells Bros. Co. to the American Bridge Co. Miliken Bros. have had a very good week, having secured the contract for the new Singer Mfg. Co. building at Elizabethport, requiring 3,000 tons of steel and others for structures for the Chemical National Bank, the Home Club, and a cement plant in New York State aggregating together some 1,200 tons.

There has been a fair demand for the lighter shapes, plates experiencing a slightly increased activity and business in bars being fair. We quote New York prices at tidewater: Angles, 3 to 6 in. x ¼ in. and heavier, 1.74½c; beams, 3 to 15 in., 1.74½c; channels, 3 to 15 in., 1.74½c; beams, 18, 20 and 24 in., 1.84½c; tees, 3 x ¼ in. and heavier, 1.79½c; plates, carloads, tank, 1.74½c; flange, 1.84½c; marine and ordinary firebox, 1.94½c; refined iron bars, 1.60c; soft steel bars, 1.64½c to 1.67c; sheets in carload lots, New York, No. 28, black, 2.40c.

Old Material.—The demand for old material is more active, especially for wrought and heavy melting steel scrap, and prices seem to be more firm all along the line. Consumers are apparently willing to buy at full prices, but the larger dealers are not anxious to sell, believing that better prices are at hand. The market is decidedly in the sellers' favor and, while the business being transacted is not large, the indications point to an active buying movement to begin the latter part of the month.

Old iron rails	$20.00 to 21.00
Old steel rails, long lengths	14.50 to 15.00
Old steel rails, short pieces	14.00 to 14.50
Relaying rails	20.00 to 21.00
Old car wheels	14.00 to 14.50
Old iron car axles	21.00 to 22.00
Old steel car axles	18.50 to 19.00
Heavy melting steel scrap	13.50 to 14.00
No. 1 railroad wrought scrap	17.00 to 18.00
Iron track scrap	15.00 to 16.00
Wrought pipe	11.00 to 12.00
Cast borings	8.00 to 8.50
Wrought turnings	12.25 to 12.75

Pig Iron Certificates.—The market on the Produce Exchange has been steady with very little offering and only a spasmodic desire to buy. Prices rule, if anything, a trifle lower than in the outside market. Foundry warrants follow:

	Bid.	Asked.
August	15.00	15.40
October	15.20	15.40
November	15.20	15.45
December	15.20	15.45
February	15.20	15.75

BIRMINGHAM.

Preparations for Increasing Pig Iron Production—Prices Firm.

BIRMINGHAM, ALA., July 31.—The month of July closes in Alabama with the iron manufacturers all in a happy frame of mind, their order books well filled and efforts now being turned to a larger production. The Sloss-Sheffield Steel & Iron Co. does not hesitate in announcing that its sales for the month just closing aggregate over 100,000 tons. The Tennessee Coal, Iron & Railroad Co. has sold a great tonnage also, while the other companies have done well. Every effort is now to be made to deliver the goods and the railroads have been advised that they will be expected to furnish cars at a lively rate in order that all obligations can be met. The production will be increased at once. The Sloss-Sheffield Steel & Iron Co. will positively blow in its No. 2 furnace at North Birmingham this week. Within the next three weeks the two furnaces at Bessemer of the Tennessee Coal, Iron & Railroad Co. will be blown in. Raw material will be assembled at once at the two Oxmoor furnaces of the Tennessee company and they will be started also in the near future. The five furnaces will add nearly 1,000 tons a day to the iron output of the district.

Iron quotations are firm at $12 per ton No. 2 foundry, though indications point to another advance in the near future. The Sloss-Sheffield Co. on Saturday sold one lot of 1,500 tons of iron at the rate mentioned, $12 per ton, No. 2 foundry. Second Vice President J. W. McQueen stated that the market was very strong and the prospects were that consumers were in need of more iron.

There is a scarcity of labor at the mines, furnaces and mills. The Tennessee Coal, Iron & Railroad Co. brought in two carloads of laborers from New York Saturday night and will place the men to work about the mines and coke ovens.

The following quotations are given: No. 1 foundry, $12.50; No. 2 foundry, $12; No. 3 foundry, $11.50; No. 4 foundry, $11; gray forge, $10.50 to $10.75; No. 1 soft, $12.50; No. 2 soft, $12.

The production of steel at Ensley shows a little falling off for the month of July as compared to the output of the month previous. There were experiences which brought about a reduced output. Saturday nights at the furnace and steel plants at Ensley have been hard ones on account of the scarcity of labor. The Alabama Steel & Wire Co. will place two more of their woven wire machines in operation at their Ensley plant, a good demand for this product having been received. This company is also turning out billets for the Sheffield rolling mills which concern has a large order for cotton ties. The Alabama Steel & Wire Co. works on the Sheffield order, though, on Saturdays, giving the balance of the time on rod, wire and nails in its own plant.

M. E. Duncan, representative of the American Car & Foundry Co., was in the Birmingham district last week making investigations as to a location for the erection of a large car plant. It is stated that the American company is considering the erection of a plant to cost $1,000,000, which will give employment to several hundred men. Mr. Duncan visited Bessemer, North Birmingham, Ensley and other parts of the district. He will report to his board of directors at a meeting to be held shortly in St. Louis when definite statements will be made as to the project.

The North Birmingham Forge Co. has been incorporated

by J. H. Minge, W. E. Nichols and E. J. Smyer, capital stock $20,000. The company will put up a plant at once at North Birmingham. Mr. Minge and Mr. Nichols have been interested in other plants in this district for some time and go into business for themselves.

The North Alabama railroad (Louisville & Nashville R. R. Co.), has let the contract for the extension of its road twenty miles from the edge of Jefferson county, into Walker county, reaching the coal properties of the Pratt Consolidated Coal Co., the largest independent coal company in the State. The Pratt Consolidated Coal Co. is opening a dozen new mines and the new railroad is promised heavy traffic for some time to come.

PHILADELPHIA.

Pig Iron Firmer and Sales Fair—The Finishing Mills Very Busy.

August 2.

Nothing has occurred during the past week to disturb the optimistic feeling that the market has passed the worst days of 1905 and that the next few weeks will witness a steady improvement. No sensational advance is looked for, but it will not be surprising if the next week or fortnight witnesses an advance of a quarter or 50 cents in most grades of pig iron. The buyers are in the market and the Northern producers, while not inclined to follow Southern makers in rapidity of price-raising, will naturally be disposed to adjust their figures to the demand. Sales of Southern iron have received a decided check through the sudden advance in prices, and this has helped the local situation.

Pig Iron.—There is a firmer tone to the market than has been noticeable for some time, which is generally taken as meaning a large business at more satisfactory prices in the near future. Sellers report a fair number of orders, especially for foundry irons, and the amount of iron going into consumption continues to be enormous. The feeling is one of great confidence on the part of the producers and buyers, realizing that the day of bottom prices for the year is apparently past, are more inclined to come into the market and place their orders without undue haggling over prices. There has been no substantial change in prices, except for Southern iron, but if general conditions continue as favorable as at present it is generally expected that August, or certainly September, will see quite a decided advance. Prices in the meantime may be quoted as follows:

No. 1X Foundry	$17 25 to 17.50
No. 2X Foundry	16 25 to 16.75
No. 2 Plain	15.75 to 16.25
Standard Gray Forge	14.75 to 15.00
Ordinary Gray Forge	14.25 to 14.50
Basic	15.50 to 16.00
Low Phosphorous	20.25 to 20.75
Southern No. 2X, rail	16.00 to 16.25
Southern No. 2X, dock	15.50 to 15.75

Finished Material.—The pressure on the mills making plates and structural material daily grows greater, and some orders recently placed cannot, it is said, be filled for eight or nine months. With the business now hanging over the market, and which will be placed this fall, some mills will be assured of steady work for the greater part of 1906 without taking any more new business. All lines show an improvement and premiums have been increased for anything like reasonable delivery. Prices remain unchanged as follows: Beams, channels and angles, according to specifications, 1.73½c to 1.90c; refined iron bars, 1.63½c to 1.80c; steel bars, 1.63½c to 1.70c; plates, 1.73½c to 1.80c.

Old Material.—The improved situation at the mills is shown in the increasing demand for scrap at advancing prices. It cannot be said that there is any boom, but business is much more satisfactory than a few weeks ago. The following prices show an advancing tendency in several lines:

Old steel rails	$16.00 to 17.00
No. 1 steel scrap	15.50 to 16.00
Old steel axles	17.00 to 18.00
Old iron axles	21.00 to 22.00
Old iron rails	18.00 to 19.00
Old car wheels	15.00 to 16.00
Choice scrap, R. R. No. 1 wrought	17.00 to 18.00
No. 1 yard scrap	15.50 to 16.50
Machinery scrap	14.50 to 15.00
Low phosphorus scrap	19.00 to 20.00
Wrought iron pipe	13.00 to 13.50
No. 1 forge fire scrap	13.75 to 14.25
No. 2 forge fire scrap, ordinary	10.50 to 11.50
Wrought turnings	11.50 to 12.50
Axle turnings, heavy	13.50 to 14.00
Cast borings	8.50 to 9.00
Stove plates	11.00 to 11.50

The Metal Market.

NEW YORK.

August 2.

Pig Tin.—A decrease in the July East Indian shipments caused a rise abroad and the local market followed promptly. There has been only a moderate movement in the domestic field, but prices rule firm and higher. Today's closings: Spot, 32.85c to 33.25c; August, 32.75c to 33.14c; September, 32.50c to 33c; London, £151 5s and £140 15s. Arrvals 3,510 tons to date, with 3,030 tons afloat.

Copper.—The past week has witnessed a sharp advance and prices have reached the highest point attained in the past four years. After the large transaction of the two months past current buying seems inconsiderable, orders ranging from 25 to 50 tons per lot. Most of the buying has been in the interest of European melters, although there is still some business in this country for October and later shipment. Today's closings follow: Lake and electrolytic, 15⅜c to 15½c; casting, 14⅞c to 15½c. London's closings today: £68 7s 6d and £68 12s 6d. Exports for the month 17,213 tons.

Lead.—There is a fair consumptive movement and the market continues firm. Prices are higher at 4.60c to 4.70c. St. Louis, 4.50c; London, £13 17c 6d.

Spelter.—Refined spelter is strong in tone, although the demand is only moderate. Prices are higher. Today's closings: Spot, 5.60c to 5.70c; St. Louis, 5.40c; London, £23 17s 6d.

WILL BE SUBMITTED TO VOTE.

The national advisory board of the Amalgamated Association of Iron, Steel & Tin Workers, at a special meeting last Monday afternoon, took up the question of calling off the strike of the Carnegie plants at Youngstown, O., Warren, O., Girard, O., and Greenville, Pa. This strike has been in progress a little over a year and the members of the local lodges at those places threatened to withdraw unless it was called off.

The board decided to place the matter before the local lodges for a vote and if the majority of members are in favor of calling off the strike and making the plants open shops, this action will be taken. The stumbling block in the way of final adjustment is that the puddlers are receiving the Amalgamated scale while the finishers are not and the question arose as to whether it would be proper to open one part of the plants and not the remainder, as the association cannot consent to its men returning where they do not receive the scale. The proposition is now up to the men themselves and resolves itself into a voting contest between the finishers and puddlers.

D. M. Simpson & Co., which owns the Trafalgar Engine Works at Barbados, has been converted into a limited liability company. All interests in the firm remain unchanged, and the board of directors consists of D. M. and G. Y. and D. G. Simpson.

GENERAL ADVANCE

In Industrial Stocks—Increased Railroad Dividends—General News.

Investors who await this part of the year with a great deal of interest owing to the fact that dividends become payable at this time, have been uniformly gratified with the favorable indications of the past six months. Many important dividend announcements have been made in the past month the particularly favorable feature being, that when any change in the regular dividend has occurred it has been in the direction of larger payments with but one or two exceptions. As indicative of the general trend, may be quoted the increase in the dividend of B. & O. railroad common stock, Union Pacific common, Illinois Central and Amalgamated Copper. The Union Pacific, which previously paid common shareholders on the basis of 2 percent semi-annually, this time makes the declaration 2½ percent. While this increase has been confidently expected, it is none the less reassuring to note the careful management and wise foresight which has enabled this company, controlling one of the foremost industries of the country to carry on its affairs so prosperously. The figures for the entire twelve months are not yet available, but for the 11 months to May 31, there was a gain of $3,443,327 in gross and a gain of $2,225,458 in net, as compared with the previous year. Despite the possibility for greater display in a larger increase, the management have very conservatively avoided increasing the rate of distribution more than 1 percent per year. The same conservative management is to be noted in the affairs of the Illinois Central, which despite the fact that the increase which was added to its dividend of 3 percent six months ago, has been repeated, still terms it an extra payment. The returns to shareholders are the same as though that increase had become a part of the regular dividend, but at the same time the company avoids placing itself in a permanent position unwarranted by its actual earnings. The Illinois Central is paying a semi-annual dividend of 3 percent, with an extra payment of ½ percent, making a total of 3½ percent.

More notable than any of these, however, is the later announcement that the Erie railroad has declared an initial dividend of 4 percent on its $16,000,000 of second preferred stock. These declarations together with the excellent steel corporation report, splendid crop prospects, and the ease of the money market have produced a uniform and decidedly bullish tendency on the stock market. Pittsburg Coal is rapidly regaining its former position, after its slump of a week ago, selling around 56½.

Following is a comparison showing the trend of the industrial stocks during the week July 24-31. The uniform rise in stocks is evident.

	July 24	July 31	Changes
Allis Chalmers Co.	15⅝	19¼	+4⅛
Allis Chalmers Co. preferred	57½	63	+5½
American Car & Foundry,	35½	37⅜	+1⅞
American Locomotive	47¼	49	+1¾
American Locomotive preferred	111	111	.....
American Steel Foundries	8¾	9¼	+ ½
American Steel Foundries preferred	39	.....	.....
Colorado Fuel and Iron	44½	46¾	+2¼
Pittsburg Coal Co	13	16	+3
Pittsburg Coal Co. preferred	48	56	+8
Pressed Steel Car	39	42⅞	+3⅞
Pullman Palace Car	239	.....	.....
Railway Steel Spring	34⅜	35¼	+ ⅞
Sloss-Sheffield	81	87	+6
Tennessee Coal & Iron	86	90⅛	+4⅛
U. S. Cast Iron Pipe & Foundry Co.	31⅜	31⅜	.....
U. S. Steel	33¾	35½	+1¾
U. S. Steel preferred	101⅞	103¾	+1⅞
U. S. Steel 5's	94⅝	95⅛	+ ½
Republic Iron & Steel	19⅞	21¼	+1⅜
American Shipbuilding	54⅛	53¼	− ⅞
American Shipbuilding preferred	105⅛	106	+ ⅞

Later advices than the record of the above table shows, quote United States steel common 35⅛ and preferred 103⅝, which is a recession from the high point. United States steel preferred has risen in a year some 40 points, to almost its high level, 104⅞. Republic Iron & Steel common fell back to 20⅛ Tuesday, and preferred declined from 83⅞ to 83¼. American Ship common shows very strong and closed Tuesday with a rise to 53½, with preferred constant.

IMPORTS AND EXPORTS FOR JUNE.

This trade in iron and steel was much the same in both May and June in the totals, exports amounting to 71,490 tons in June, as compared with 74,072 tons in May. Imports in June were 40,333 tons, which was 2,954 tons more than in May. Through the last twelve months a noticeable fact is the uniformity with which exports have fluctuated inversely as the imports. For the twelve months ending June, 1905, the export totals compare most favorably with a corresponding period ending in 1904. The figures show a gain from 675,521 tons to 1,123,579 tons. The reverse is true of imports. The imports for twelve months ending June, 1904, were 502,250 ton, as compared with 287,301 this year. The values of iron and steel exports for those corresponding periods of twelve months were remarkably close, the 1904 figures reaching a total of $11,681,020, as compared with $11,820,655 for 1905. These totals include the value of machinery exported and do not include ore. The values of imports were $2,039,798 in 1904 and $2,646,258 in 1905.

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES—GROSS TONS.

	June		12 mos. end'g June	
	1904	1905	1904	1905
Pig iron	2,659	1,390	34,635	46,971
Scrap	2,206	716	16,845	19,710
Bar iron	2,544	1,776	22,669	32,323
Wire rods	2,962	864	15,780	15,738
Steel bars	5,702	982	21,449	24,164
Billets, ingots and blooms	32,068	9,708	176,901	236,155
Hoop, band or scroll iron	265	278	2,833	3,029
Iron rails	196	.....	1,513	78
Steel rails	51,101	22,340	160,804	409,429
Iron sheets and plates	722	926	5,934	5,556
Steel sheets and plates	1,984	8,867	19,150	71,000
Tin plates, terne plates and taggers' tin	542	816	3,638	10,264
Structural material	5,866	4,907	35,884	73,287
Wire	9,384	12,508	118,782	126,178
Cut nails	963	1,583	9,588	9,102
Wire nails	2,345	3,540	32,431	36,856
Other nails, including tacks	261	234	2,554	3,739
Total	119,170	71,490	675,521	1,123,579

The noticeable feature in the monthly statement of exports is the uniform falling off in almost every article in the comparison of June, 1904, and June, 1905. Sheets, structural material and wire nails were the only exports of any magnitude which gained or held their own, the increase in steel sheets being quite large.

IMPORTS OF IRON AND STEEL TO THE UNITED STATES—GROSS TONS.

	June		12 mos. ending June	
	1904	1905	1904	1905
Pig iron	4,062	17,117	191,135	128,084
Scrap	2,358	1,669	28,614	12,550
Bar iron	2,699	4,091	80,436	36,669
Iron and steel rails	6,808	8,277	58,358	17,023
Hoop, band or scroll	17	232	1,820	1,918
Steel ingots, slabs, billets or bars	697	910	91,922	9,801
Sheets and plates	223	231	10,198	2,108
Tin and terne plates	6,674	5,415	86,636	71,905
Wire rods	1,697	1,514	18,519	15,283
Wire and wire articles	210	258	4,953	3,851
Structural shapes	706	619	14,310	8,157
Total	26,091	40,333	502,250	287,301

While the total imports for June, 1905, are considerably larger than for June 1904, that increase is almost entirely due to the heavy importation of pig iron, which jumped from 4,062 tons in June of last year to 17,117 tons this year. The other products were received in much the same quantities. The report is not particularly favorable one.

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LARGE EARNINGS, GOOD BOOKKEEPING.

A very satisfactory showing was made by the United States Steel Corporation for the quarter ended June 30 last, as indicated by the quarterly report printed last week. The steel corporation was an even four years old when that quarter started, and of the 48 preceding months there were 24 which showed lower monthly earnings than the lowest in this quarter, 10 which showed profits intermediate between the lowest and highest, and only 14 months which showed greater earnings than the highest of the quarter. The earnings for the quarter were 15 percent greater than the average earnings for the 48 months. One must go back to the third quarter of 1903 to find a quarter with equally large earnings, and if regard is had to the fact that in that year ore profits were assumed as soon as the ore was mined and shipped, instead of being, as now, carried into a special account and not reported until the finished material leaves the corporation, the quarter named does not compare favorably with the quarter just ended. The corporation's best year was 1902, but in this year the average monthly profits were but $1,000,000 per month higher than the average in the quarter now reported upon. These various comparisons are made in order to show that, however the viewpoint is selected, a very satisfactory showing is indicated.

The augury for the future is very favorable. However arrived at through bookkeeping methods, profits are in their ultimate analysis the product of profits per ton multiplied by tonnage, and profits per ton are the difference between manufacturing cost and selling price. The tonnage of the third quarter will fall very little, if any, below that of the second, while fourth quarter tonnage will doubtless compare quite favorably with that of the first. Profits per ton will certainly be larger, since manufacturing costs will be substantially unchanged and prices realized will be better, on several scores.

In the first place, a higher level of prices is being gradually established. The nominal advances were made months ago, but through the existence of old contracts did not become effective as regards the great bulk of the tonnage. The last important price advances were as follows, per net ton: Feb. 1, wire products, $1.00; Feb. 9, blue annealed sheets, $1.00; galvanized sheets, $2.00; Feb. 16, plates and shapes, $2.00; Feb. 28, merchant steel bars, $2.00; March 16, black sheets, $2.00, blue annealed sheets, $1.00. There has been more or less doubt all along whether some of these advanced prices would ever become the prices on large contracts. These doubts should be pretty well set at rest by the developments of the past month, including the booking of large tonnages of merchant steel bars from the agricultural implement makers for the year through next June, at the full price, and the continued heavy demand for plates and shapes. In sheets, tin plates and wire products the market is gradually working up to the higher level.

Thus far, then, there are clear evidences of a higher range of selling prices for very important products of the steel corporation. In another respect also it will obtain higher prices, since rails are among its most profitable products, and rail tonnage will be much greater in the second half than in the first half. The Ohio mill at Youngstown will be on rails probably the whole of the second half, as against billets and sheet bars in the first half. At the Edgar Thomson works the new light rail mill will soon be in operation, conducing to a larger tonnage of standard sections in the two older mills at the plant.

The decrease during the second quarter of unfilled orders on hand has been commented upon as unfavorable. The decrease was only 767,905 tons. The decrease during the same quarter in 1904 was almost a million tons. During the first half of this year there was an actual increase of 133,452 tons. The increase in the first half of the phenomenal year 1902 was not much greater than this, while in 1903 there was a decrease of 680,675 tons, and in 1904 a decrease of 22,846 tons.

Furthermore, a statement prepared on July 31 would undoubtedly show a large increase in unfilled orders over the statement for June 30, as regards a great many lines of finished product, and perhaps as regards all, since in those lines which have not been very active marketwise production has also been comparatively small.

The book disposition of the last quarter's earnings is very satisfactory. In the previous three years, the allowance for depreciation, replacement, etc., averaged about $13,500,000 per year, and the smallness of the allowance elicited some comment. For the quarter just ended, the allowance is a trifle over $5,000,000, or at a rate half again as great as in previous years, but beyond this is a special allowance of a million, so that when a surplus of $10,570,681 is shown for the quarter it is a more conservatively reached surplus than has been shown in previous reports. This surplus, however, is not allowed to remain, there being at once appropriated from it $7,500,000 for various expenditures which otherwise would have been charged against the capital account. A similar deduction in the first quarter amounted to $3,300,000, so that in the half year the book surplus is increased by only $5,644,088, making it about $67,000,000 on June 30, 1905. By a less conservative system of bookkeeping the apparent surplus could have been made much larger. If, as is hinted by some critics, the large appropriations this year only balance the shortcomings in this direction in 1904, the present procedure deserves commendation just the same.

While there are various reports in circulation to the effect that a resumption of dividends on the common stock has been considered by the management, it would really seem that the management is endeavoring, by its liberal quarterly deductions from apparent surplus, to remove any excuse for such resumption.

THE SOO SEMI CENTENNIAL.

The improvements made by the United States government in the Great Lakes' waterway have been an object lesson to the world in showing how industries can be wonderfully developed by means of water transportation and it is indeed fitting that, after the lapse of half a century, the completion of the first important undertaking in providing a deep channel in the lakes is being celebrated in a manner which impressively calls attention to all that the building of the Soo canal has meant and will mean to the progress of the nation.

No industry has so directly or to such a large extent benefited from the government work on the Great Lakes as that of the manufacture of iron and steel. Many statistics might be cited to show how, by the decrease in cost of carriage by water and in handling of ore at docks, the marvelous development of this industry has been made possible and only within a few days the advantage enjoyed by furnaces along or comparatively near the lakes as contrasted with those located at a considerable distance has been shown in the shipments of ore from Minnesota to Colorado, a distance of slightly more than 1,300 miles, at a cost of $4.50 per ton, while ore is carried on the lakes more than 800 miles, from Duluth to Lake Erie ports, for 75 cents per ton. If the Colorado furnaces could get their ore by water at the rate now prevailing on the Great Lakes, it would cost them for freight less than $1.50 per ton and the problem how to build an iron industry in the far west would be solved. When nature has made it possible to cheapen transportation by using magnificent bodies of water, although it may be necessary to supplement nature's work by man's improvements, it is folly hardly less than criminal not to do so. In providing a 21-foot channel in the lakes, the United States government has achieved a splendid undertaking but the good work must not stop and no more appropriate time than this week of the Soo semi-centennial could be selected for all who have faithfully served the cause of deep waterways in the past to pledge themselves anew to untiring effort to influence the nation's legislators to do their part fully and to arouse the cities of the lakes not to shirk their duty in co-operating with the government.

It is fortunate that at this semi-centennial time, the men who made the development of the Lake Superior ore ranges possible are not forgotten. Much has been written about the geology of the mining districts and about mining operations, and Prof. Mussey has just published a valuable economic study on "Concentration in Lake Superior Iron Ore Production," of which we shall publish extended abstracts next week, but, until the appearance of Mr. Williams' admirable volume, "The Honorable Peter White," justice had not been done the pioneers of the mines. As these sturdy men are rapidly being gathered to their fathers, the story could not in later years have been obtained from their lips and much of value and intense interest would have been lost forever.

END OF HOUSESMITH'S STRIKE.

The strike of the housesmiths on the Blackwell's Island bridge has been declared off. The strike was in sympathy with striking iron workers of the Pennsylvania Steel Co. at Harrisburg, Pa., and had stopped all work on the bridge since June 18, when it went into effect. Work will now be rushed along in order to overcome the delay, and it is expected that within a few days 200 housesmiths will be at work. The New York housesmiths are to be paid 56.25 cents an hour, the working day being eight hours, and 31.25 cents for overtime.

Watching the Continuous Mill.

The operation of the South Sharon sheet steel mill of the United States Steel Corporation is being watched with considerable attention, and its success may mean the remodeling of other sheet steel mills of the corporation. Everything will depend upon the success of the continuous sheet mill, which has been running two or three weeks on trial. It is claimed that in the event the mill comes up to expectation a reduction of cost amounting to about $4 per ton in the cost of production may be made.

Mrs. Eliza Ann McMasters King, one of the oldest and most respected residents of Pittsburg, and mother of Willis L. King, vice president of the Jones & Laughlin Steel Co., died at her home last Sunday morning after a brief illness. She was a sister of Mrs. B. F. Jones, widow of B. F. Jones, and an aunt of B. F. Jones Jr., the present head of the steel company. The funeral was held Tuesday afternoon.

BENNINGTON DISASTER

AND OTHER EXPLOSIONS DISCUSSED BY BOILER MANUFACTURERS.

At their Seventeenth Annual Convention.—Composition of Steel for Boiler Plates.—Pittsburg for Next Meeting

(Special Correspondence.)

Toronto, Canada, July 29.—The Seventeenth Annual Convention of the American Boiler Manufacturers' Association of the United States and Canada was held at the King Edward hotel, Toronto, commencing July 25, and lasting for three days. About 120 were in attendance, accompanied by a large number of ladies.

President R. Munroe, Jr., of Pittsburg, occupied the chair. Addresses of welcome on behalf of the city of Toronto were given by Acting Mayor John Shaw and Chairman John J. Main, of the local committee, to which President Munroe and W. H. S. Bateman, of Philadelphia responded in appropriate terms.

President Munroe, in his annual address, reviewed the course of the association since its establishment in 1889, and the beneficial results which had been effected by its work. He was gratified to observe that some matters of great practical concern not only to the association, but to the public, were to be submitted for the consideration of the convention. He referred in particular to the endeavor that would be made to secure better recognition from the United States government of the expert opinions of practical boiler manufacturers in the framing of regulations. He congratulated the members on the cordial welcome, they had received and the lavish provisions made for their entertainment.

Sympathetic resolutions were passed in memoriam of the late John O'Brien, of St. Louis, former president of the association, and also of the late John Rohan, of St. Louis.

The meeting took up the matter of the unsatisfactory condition existing in regard to trade terms of settlement with buyers, the variations in practice extending to about six months and a committee consisting of J. B. Campbell, H. D. McKinnon and J. D. Smith, was appointed to consider the question and report as to the adoption of uniform terms.

Among the questions discussed were, "What are the Causes of Boiler Explosions?" and "Laws Governing Boiler Inspection." The consensus of opinion among those who took part was that explosions and boiler accidents were mainly due to lax inspection and carelessness in operation. A contributory factor was the lack of clear, concise regulations, as shown by the fatal explosion on the gunboat Bennington. Reference was made to the action of the association in urging on the United States Congress the revision of the regulations governing the inspection of marine and other boilers.

Wednesday's Session.

Col. E. D. Meier, of the Heine Safety Co., New York, chairman of the Committee on Uniform Boiler Specifications, presented the committee's report, which noted that although the bills introduced into Congress through the committee's action had failed to pass, the disaster to the steamer Slocum had subsequently brought the matter of revision forcibly before Congress. The new Secretary of the Department of Commerce and Labor, Hon. V. H. Metcalf, had called the Board of Supervisory Inspectors together to report amendments to the rules of the steamboat service. To some of these amendments exception was taken as unnecessarily onerous. Traill's rules made for iron plate and rivets, gave incorrect results for steel, and the whole subject of riveting should be more fully discussed and arranged so that all modern seams, viz., double-riveted lap, triple-riveted lap, single-butt strap and double-butt strap should be given their due value. It was an injustice to allow .06 percent of phosphorus in plates made by the acid process, while limiting those made by the basic process to .04 percent, and the report urged that the latter percent should be fixed for both kinds of plate. Finally the committee protested against the injustice of exempting iron tubes from the careful tests provided for steel tubes, as contrary to the practice of the most competent inspection bureaus and entirely unjust, as during the last ten years steel tubes have improved, while iron tubes have deteriorated.

Suggestions for amendments in the report of the supervising inspectors had also been handed in by P. F. Dundon and T. M. Rees. The former had suggested that inspectors must criticize and either correct or improve drawings and specifications for boilers, and that when boilers were built according to specifications they must be accepted anywhere in the United States, and that when the inspector condemns any part of a boiler he shall specify exactly the repairs to be made. Col. Meier had attended the Convention of the Association of American Steel Manufacturers at Pittsburg in February, in reference to the proposed agreement on standard specifications for boiler steel between the steel manufacturers and the Boiler Manufacturers Association, but it was found impossible to come to an agreement on account of the differences of opinion with regard to chemical quantities, and it was suggested that a joint committee should make a final adjustment of the difference. Further correspondence had resulted in an invitation to the A. A. S. M. to meet the boiler manufacturers in Toronto.

The co-operation of the American Society for Testing Materials in the movement for revision of the steamboat inspection laws had been secured. The report called the attention of the builders of marine boilers to 40 amendments to the rules in connection with the steamboat inspection service. There was a necessity for a complete revision of steamboat inspection laws by an expert committee acting on the general lines given in the bills, which the association had introduced into Congress. It would be feasible and proper for a committee to agree with the Department of Commerce and Labor officials on the exact form of such a bill, which would have the support of the department, the steel manufacturers, the Society for Testing Materials and the Boiler Manufacturers' Association. All other methods for reaching the desired end had only resulted in the conviction that only an expert committee could properly deal with the subject. The report might not be a finalty but would clear up the subject and further improvements could be made at meetings of the Board of Supervising Inspectors, to which representatives of the great interests concerned should be invited.

The report was adopted and the committee continued, after a long discussion on the points of difference between the steel manufacturers and the boiler manufacturers as to the composition of steel for boiler plates. The steel manufacturers represented by W. H. S. Bateman (Lukens Iron & Steel Co., Coatesville, Pa.) and George R. Bentley (Central Iron & Steel Co., Harrisburg), objected strenuously to being bound to furnish a grade of steel having a proportion of sulphur of not over .025 percent, and thought that the maximum percentage of sulphur should be placed at .035. The principal speakers in favor of the specifications fixing the maximum of sulphur at .025 were T. M. Rees, of James Rees, Son & Co., Pittsburg; R. Hammond, Lake Erie Boiler Works, Buffalo; J. M. Robinson, Atlantic Works, Boston; John J. Main, Polson Iron Works, Toronto; President Munroe,

Geo. Munroe & Son, Pittsburg, and H. J. Hartley, Cramp Shipbuilding Co. Col. Meier suggested .03 percent as the basis of a compromise between the two associations, and there appeared to be a disposition on the part of many members to accept this as the solution of the difficulty, though the representatives of the steel manufacturers opposed making any concessions.

Another discussion took place over the question of high tensile steel plate, especially to be used for the shell plate of marine boilers, in which Messrs. Bentley, Bateman, Rees, Hammond, Lappan, Hartley and others took part. Some of the boiler manufacturers were rather in favor of increasing the tensile strength in order to meet the requirements as far as pressure was concerned. The steel makers, while they agreed that they could increase the tensile by raising the carbon did not advocate such a move, as being contrary to all the best methods in vogue in steel manufacturing and not in keeping with the results obtained from present methods in use for many years and improved on from time to time.

The following officers were elected: E. Munroe, Jr., Pittsburg, president; J. D. Farasey, Cleveland, secretary; Joseph Wangler, St. Louis, Mo., treasurer; M. F. Cole, Newman, Ga., first vice president; John J. Main, Toronto, Can., second vice president; John Rourke, Savannah, Ga., third vice president; J. Don Smith, Charleston, S. C., fourth vice president; Geo. H. Kittoe, Aurora, Ill., fifth vice president.

The following are the officers of the associate members: W. O. Duntley, Chicago, president; J. T. Corbett, Chicago, vice president; W. H. S. Bateman, Philadelphia, secretary; H. B. Hare, Cleveland, treasurer.

Pittsburg was chosen as the place for holding the next convention.

Thursday's Session.

A resolution introduced by Col. Meier was adopted after some discussion, protesting in strong terms against the practice of supply houses and mills furnishing materials and partly finished product to others than boiler makers, thus encouraging them to take away work legitimately belonging to the latter. The resolution requested the discontinuance of the practice and instead of supplying such goods to outsiders to refer them to the shops on whose patronage they depended for the bulk of their business and stated that the association would prefer to have this done under a feeling of mutual good will and not to be compelled to adopt arbitrary measures.

The convention closed with the usual complimentary resolutions.

A banquet was given at the King Edward in the evening at which the principal speakers were President Munroe, W. P. Bull, James Lappan, John J. Main, W. H. S. Bateman, W. G. Duntley, J. D. Farasey and Geo. N. Riley.

During the three days of the gathering there were a large number of excursions and entertainments, which were much appreciated.

New Trackage on the Erie.

The Maintenance of Way forces of the Erie are now engaged in laying 350 miles of 90-lb. steel rails on the main track. A larger mileage has never been laid in any one year before. The Erie has always been noted for its good track, and the management finds that it is necessary to use a heavier rail on account of the weight of the several hundred new engines that have been purchased in the last two years. Much of the rail being removed has been in service only four or five years and will be used on branch lines.

MARITIME DISPLAY

Is a Feature of the Soo Celebration—Distinguished Speakers.

The semi-centennial of the completion of the first canal at Sault Ste. Marie is being celebrated with appropriate exercises this week, at Sault Ste. Marie. This canal was begun in the spring of 1853 and water was let into its completed channel in April, 1855. The first vessel, the side-wheel steamer Illinois, was locked through on June 18, 1855, and was, therefore, the first vessel to make a continuous trip through the lower lakes into Lake Superior. The steamer Baltimore, which passed down shortly after, was the first steamer to make a continuous trip in the opposite direction. In point of commerce it has grown to be the world's unrivaled canal. There is really no artificial waterway that can adequately be called second to it, since even Suez does not do one-third the business done at Sault Ste. Marie.

Special rates were made on the railroads and steamship lines and the attendance at the celebration is large. Charles T. Harvey, who built the first canal in 1855, is acting as chief marshal of the occasion. The maritime display, being merely the accumulation of a few hours, is excellent, and affords a striking contrast to the scene of fifty years ago, when there was scarcely more than a dozen vessels altogether on Lake Superior, the whole of which could have been very comfortably stowed away in the hold of any one of the steamers lying at the docks.

The historic town of Sault Ste. Marie is brilliantly decorated in honor of the celebration. By day it is gay with flags and bunting and at night sparkles with innumerable electric lights.

The celebration Wednesday consisted of band concerts, a military parade and Indian games. The Indian is the original inhabitant of Sault Ste. Marie. While it is the oldest town in Michigan, the Indians were there long before the white man came, and as far as can be determined there has always been a permanent settlement at the rapids. On Wednesday evening there was a fine illumination of the canal, the rapids and St. Mary's river, the vessels mobilized in the harbor shooting off fire works.

Thursday will be generally given over to the commemoration exercises. The address of welcome will be delivered by the Hon. Chase S. Osborn of Sault Ste. Marie. Governor Fred M. Warner of Michigan, will deliver an address upon "The State of Michigan and the Building of the St. Mary's Canal." The historical address, "The Development of the Lake Superior Region," will be delivered by the Hon. Peter White, president of the Semi-Centennial Commission. Senator Julius C. Burrows will speak upon "The Future of American Commerce." The Hon. T. E. Burton, chairman of the committee on rivers and harbors of the house of representatives, will deliver an address on the improvement of waterways, and William Livingstone, president of the Lake Carriers' Association, will speak on "Navigators of the Great Lakes." Attention will be paid to these addresses in the next issue of the Iron Trade Review.

New Wire Nail Factory in Canada.

According to a consular report a factory for the manufacture of wire nails has been established in Vancouver, British Columbia, and is being worked to its full capacity. All raw materials for the plant are brought from England. As there is an abundance of iron ore nearby, it is believed than an opportunity is presented to build a blast furnace, rolling mill and wire drawing plant in the vicinity.

AMERICAN STEEL & WIRE CONVENTION

Traveling Sales Agents Have a Good Time at Chicago.

The convention of traveling sales agents of the American Steel & Wire Co. was held at the Auditorium, Chicago, July 26-29. This was the second annual gathering of the salesmen and was more generously attended than the one a year ago. The spirit of the convention is evidenced by the following lines on "Initiative" by Elbert Hubbard, which graced the first page of an interesting and instructive program booklet:

> The world bestows its big prizes, both in money and honors, for but one thing.
>
> And that is Initiative.
>
> What is Initiative?
>
> I'll tell you: It is doing the thing without being told.
>
> But next to doing the thing without being told, is to do it when you are told once. That is to say, carry the message to Garcia: those who can carry a message get high honors, but their pay is not always in proportion.
>
> Next, there are those who never do a thing until they are told twice: such get no honors and small pay.
>
> Next, there are those who only do the right thing when necessity kicks them from behind, and these get indifference instead of honors, and always a pittance for pay. This kind spends most of its time polishing a bench with a hard-luck story.
>
> Lower down in the scale we get the fellow who will not do the right thing even when some one goes along to show him how and stays to see that he does it: he is always out of a job, and receives the contempt he deserves, unless he has a rich Pa, in which case destiny patiently awaits 'round the corner with a stuffed club.

The meetings and discussions were arranged for as follows, ending with an excursion on Saturday to Joliet: Wednesday morning, Manufacturers' Trade; afternoon. Merchants' Trade; Thursday morning, Woven Wire Fence; afternoon, Sulphate of Iron; Friday, 9 a. m. to 4 p. m. with noon intermission, Worcester Specialties, Wire Rope and Electrical; evening at 7, banquet.

The banquet on Friday evening was a typical stag affair and interspersed between the courses the good feeling prevailing gave vent to itself in a round of song.

D. A. Merriman, assistant general sales agent, was toastmaster, and the following participated in the postprandial speeches: "Competition," Frank Baackes; "Our Manufacturers," Chas. L. Miller; "Criticisms by Our Customers and Among Ourselves," Thos. H. Taylor; "What Constitutes a Good Salesman," N. R. McLeod; "How to Handle a Customer," W. H. Jennings; "The United States Steel Corporation," J. S. Keefe.

The program ended with the singing of "America," and the party adjourned to meet on Saturday for the trip to Joliet mills.

Those attending the convention, about 180 in number, were:

A. T. DeForest
E. R. Eldredge
C. H. Robinson
A. B. Stephens
E. Bray
E. R. Pool
J. F. Grant
J. H. White
W. R. Abbott
E. E. Aldous
A. B. Manship
T. H. Taylor
C. A. Brown
H. E. Horton
L. W. Owen
J. E. Sime
A. W. Sprague
J. W. Meaker Jr.
L. N. Silverman
G. W. Scott
Geo. D. Tewksbury
G. G. Parry
Chas. N. Beard
J. M. Thomas
H. D. Hart
J. H. Eggleston
B. M. Allen
W. P. Bissell
J. J. Gilmore
G. D. Kirkham
G. A. Mason
D. P. Pratt
W. T. Gairns
J. P. Tufts
J. L. Osborne
A. B. Wayne
T. B. Coles
F. A. Keyes
L. A. Dietrich
R. S. Rider
F. P. Wright
E. G. Jacques
T. S. Kilmer
H. J. McCue
H. R. McGlue
R. H. Pratt
J. L. Cotter
W. H. Vialle
W. H. Jennings
Allen Frazer
E. C. Carr
C. E. Goodnow
R. K. Sheppard
H. W. Willson
E. W. Bauschard
W. E. Eagleton
M. W. Floto
A. G. Greenberg
P. H. Wilhelm
J. G. Fletcher
A. E. Hurlbut
Herbert Gardner
J. D. Sankey
H. F. DeMena
I. A. Odell
James Gill
F. B. Shepard
J. L. Peoble
H. C. Pratt
A. W. Froude
Wm. L. Hirsch
B. H. Ryder
Geo. A. Cragin
A. O. Hoeftmann
C. R. Sturtevant
C. W. Bassett
A. R. Webb
C. M. Booth
A. F. Walker
V. Goldthwaite
P. E. French
J. N. Champlin
C. F. Collins
A. T. Weaver
Walter B. Kremer
Wm. H. Kremer
L. W. Garoutte
A. L. Bates
I. L. Sawin
P. B. Garoutte
E. J. Smith
J. A. Boyd
A. B. Moore
R. A. Beak
S. E. Olcott
Geo. L. Magill
S. F. Deems
W. H. Colley
H. H. Salusbury
S. R. Cassidy
H. P. Taylor
T. H. Powning
John W. Welch
J. M. Holloway
E. H. Derby
A. E. Ward
H. A. Parks
T. H. Fuller
J. M. Henry
Louis Drautman
Leo P. Rider
Geo. P. Rider
A. L. Wellman
W. H. Crawford
F. Baackes
D. A. Merriman
G. F. Rummel
N. R. McLeod
H. T. Pratt
O. B. Barrows
S. A. Felix
J. S. Bumbaugh
B. B. Ayers
R. B. Rawls
L. J. Johnson
E. S. Humphreys
F. W. Sykes
Geo. Chandler
Walter A. Gairns
F. W. Roche
H. L. Gray
W. H. Foege
Royal Mattice
T. C. Ham
J. B. Larkin
W. J. Kane
W. A. Sheahon
C. S. Knight Jr.
R. W. Van Pelt
Frank Stehlik
W. C. Bogue
Stanley Green
Geo. Long
C. A. Wanner
F. J. Conkling
J. S. Keefe
C. L. Miller
E. Boley
R. W. Ney
C. S. Marshall
Geo. W. Jewett
F. C. Gedge
W. C. Stone
J. Waldeck
Chas. W. Lutz
F. D. Haynes
H. O. Cary
F. L. Watson
A. F. Allen
C. A. Tuttle
R. S. White
J. H. Verrall
J. N. Moylan
E. W. Donahoe
H. G. Baldwin
H. D. Thompson
L. P. Shanahan
J. H. Swickel
Harry Field
E. W. Green
F. D. Day
J. A. Coakley
Aug. Ziesing
B. E. Hamilton
W. H. Eaton
H. T. Bennett
A. S. Post Jr.
Geo. Baker

Cleveland Cliffs Iron Co. Buys Mines.

The Priceton mine and other holdings of Tod, Stambaugh & Co. have been purchased by the Cleveland-Cliffs Iron Co. The property which is in the Cascade district, Marquette range, will, according to Wm. G. Mather, president of the company, yield 200,000 tons of ore a year. Adjacent territory will also be developed in all probability.

Concrete Ties a Success.

The report that concrete ties used by several railroads, among them the Lake Shore, had proven a failure, has been denied by a Lake Shore official. This road is using several miles of such ties with sufficient success to warrant a further use of them, which it contemplates doing.

Successful Armor Plate Test.

The test piece of steel plate submitted by the Midvale Steel Co. to the goverment to be inspected and proved, has successfully passed the government test. The plate represents about 450 tons of armor for the battleships Mississippi and Idaho, and is six-in. face-hardened.

Youngstown's New Steel Plant.

Work on the construction of the new $2,500,000 plant of the Youngstown Sheet & Tube Co., was begun July 24 and it is expected the company will be ready for operation by July, next year, it being the plan to have the buildings completed before winter sets in and the remainder of the time will be devoted to the installation of machinery. The officers of the company are: President, James A. Campbell; vice president, William Wilkoff; secretary, Geo. E. Day; treasurer, Richard Garlick. Wm. C. Reilly will be general superintendent.

The Apex Equipment Co., No. 11 Broadway, New York, is supplying the rolling stock and a portion of the track equipment for a short railway of the Tyler Lumber Co., Florida.

PERSONAL.

Edward Short will succeed Henry Green as superintendent of the Ohio Falls Iron Co., at New Albany, Ind. Mr. Green, who has gone for a European trip, will continue his connection with the company as vice president and treasurer.

A. E. Croft has been made vice president and general manager of the Featherstone Foundry & Machine Co., Chicago, to succeed H. H. Wright, who was killed last month in the Lake Shore train wreck at Mentor, O.

Prof. C. I. King, for 28 years head of the department of engineering of the University of Wisconsin, is assisting in the remodeling of the plant of the Ralston Steel Car Co., Columbus, O.

E. B. Thomas, president of the Lehigh Valley railroad, has resigned from the directorate of the American Steel Foundries. The resignation, which was caused by a pressure of other business was tendered several months ago, but made public only a few days ago.

W. A. Jones, president of the W. A. Jones Foundry & Machine Co., Chicago, has gone on a hunting trip to British Columbia and Alaska and expects to be away about two months.

The office of assistant general manager of the Hibbing group of mines of the Oliver Iron Mining Co., subsidiary of the United States Steel Corporation, has been created, and W. J. West appointed to fill the position. Superintendent M. H. Godfrey has been taken from the Clark, Chisholm, Glen and Pillsbury mines, and placed in charge of the Hull and Rust mines, the position formerly held by Mr. West. W. M. Tappan has taken Mr. Godfrey's place. The other superintendents of the corporation properties in the Hibbing district are: Chas. S. Simpson, Burt, Pool, Morris and Sellers; Willard Bayliss, Myers and St. Clair; R. J. Mitchell, Monroe-Tenner.

Mr. L. H. Miller, who recently assumed the management of the Providence Steel Castings Co., Providence, R. I., announces that the output of the plant has about doubled in the past three months, and that they are running a night force.

Adolph Kurz, of Chicago, secretary of the Northern Iron Co., Philadelphia, was on the Menominee range recently investigating properties.

A. L. Lovejoy, of the Becker, Brainerd Milling Machine Co., sailed for Europe last week. Pleasure will be mixed with business.

James F. Barr has severed his connection with the Carlisle Johnson Machine Co., to take a new position with a western firm.

S. H. Simon, formerly of Youngstown, O., is now treasurer of the Carlisle Johnson Machine Co., Hartford, Conn.

Patrick McManus, who has been superintendent of the Sterling Steel Foundry Co.'s plant at Braddock, Pa., for the last two years, has resigned to accept a position as manager of the Sharon Steel Foundry Co., at Wheatland, Pa.

A number of officers of the U. S. Cast Iron Pipe & Foundry Co. are making their periodical tour of inspection in the Birmingham district. The party is composed of George J. Long, vice president, of Louisville, Ky.; A. C. Overholt, Scottsdale, Pa.; F. A. Field, Scottsdale, Pa.; A. Drysdale, Louisville, Ky.; E. C. Fuller, Columbus, O., directors.

Chas. McCrery, with the Woodward Iron Co., Woodward, Ala., expects to sail on Aug. 9 for several months' trip abroad.

W. H. Ellis, of New York, who a few years ago successfully negotiated a commercial treaty with King Menelik ot Abyssinia, proposes to build iron works in the vicinity of the extensive ore deposits at Monclova, Mexico.

George H. Lowe, formerly superintendent of the Sligo Iron & Steel Works, has been made superintendent of the Portland Iron & Steel Co., of Ligonia, Maine.

W. M. Pratt, treasurer of the Goodell-Pratt Co., Greenfield, Mass., has returned from a two months' trip in Europe, looking after the company's varied interests abroad.

The resignation of Alex. K. Hamilton as chief engineer and superintendent of the mechanical department of the Lackawanna Steel Co., Buffalo, has been announced as taking effect Aug. 1. Mr. Hamilton occupied a very important position and is considered one of the ablest men in the steel business. The new position into which he steps will locate him in New York city, and the change will be largely to his personal advantage. Chas. J. Barr, formerly assistant general superintendent, will succeed Mr. Hamilton.

Effective Aug. 1 are these promotions on the Erie Railroad: J. M. Barrett appointed superintendent of terminals at New York and Jersey City, vice W. H. Peddle, resigned; F. J. Moser, appointed superintendent of the Chicago & Erie Railroad, vice J. M. Barrett, promoted; A. Crable appointed division engineer of the Chicago & Erie Railroad, vice F. J. Moser, promoted; A. G. Trumbull appointed assistant mechanical superintendent with office at Meadville, Pa., vice H. B. Hunt, resigned, and G. O. Hammond appointed mechanical engineer, vice A. G. Trumbull, promoted.

George L. Fairbanks has been elected vice president of The Struthers Furnace Co., Cleveland and Struthers, O., vice J. B. Stubbs, resigned. Albert Grossman has been elected secretary of the company, viceMr. Fairbank, resigned. Mr. Grossman is also treasurer and will fill both offices.

OBITUARY.

Joseph Holt Gates, a prominent electrical engineer of Chicago, died at his home on Thursday, July 20, aged 44.

Edward W. Nash, president of the American Smelting & Refining Co., died at Omaha, Neb., on July 22. He was a pioneer in the smelting industry and had been president of the smelting corporation since its organization.

William Jessop, chairman of William Jessop & Sons, Ltd., steel manufacturers of Sheffield, England, died July 4, at his country estate, Thornsett Lodge, Bradfield, England. Mr. Jessop was born October, 1856; was educated at Repton, Germany, and at Cambridge, and has grown up in the steel business, being of the fourth generation of the Jessop family in control of the above mentioned firm, which has been established since 1774. He was also president of the Jessop Steel Co., Washington, Pa. Mr. Jessop was largely interested in public institutions, being a benefactor of charitable associations, interested in banking affairs, a keen sportsman and a large owner of land which he cultivated under his personal direction. Mr. Jessop was known everywhere as an excellent landlord and a kindly gentleman.

E. C. Haines, proprietor of the Woodstown Machine Works, Woodstown, N. J., died at his home July 27. He was sixty-four years of age and was the designer of a number of machines for use in the canning industry.

Birdsall Cornell, many years ago a member of the firm of J. B. & J. M. Cornell, and a pioneer in the structural iron business in New York, died at his home in Morristown, N. J., aged 75 years. He was at one time president of the Aetna Iron Co., and was a member of several societies.

John K. Bennett, district superintendent of the Pullman Co., at Buffalo, who had been connected with the company since boynood and was widely and favorably known, died July 27 after a brief illness. He was 60 years old.

The Shops of The Joseph Reid Gas Engine Co., Oil City, Pa.

The oil regions have always held a fascination for those coming from other sections, and the amount of work connected with the getting of oil is only slightly appreciated by the average layman. The oil industry in general has given rise to a large number of specialties which are manufactured by various companies. This will show how some of these companies grew up. In 1877 Joseph Reid started a little job shop in Oil City, Pa. At one time his entire force consisted of himself and a boy, and work was not always plenty, even for that small force.

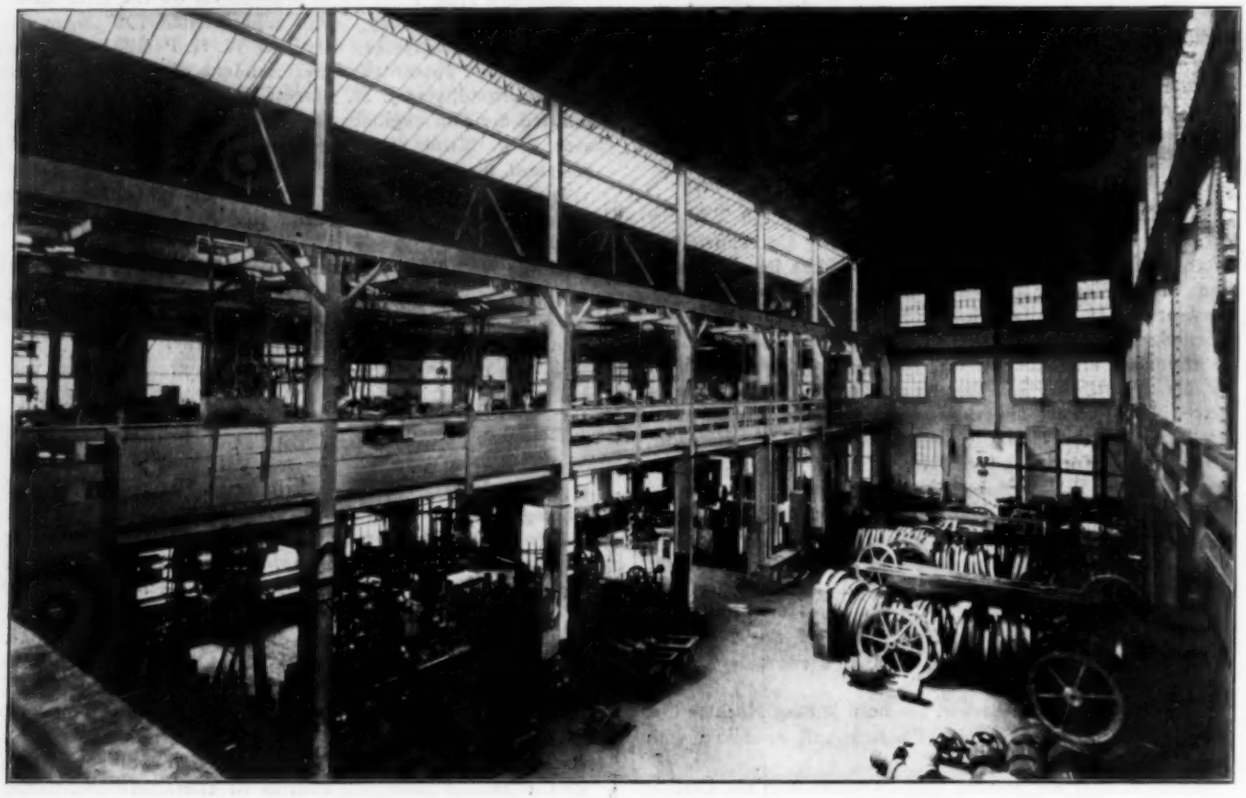


FIG. 1.—VIEW OF CENTRAL BAY OF REID GAS ENGINE SHOPS, OIL CITY, PA.

From the beginning it had been Mr. Reid's aim to do the work so that every job turned out repaired would be as good as it had been when new. While he was willing to work on as close a margin as possible price was to take second place. The work must be right. It is true that people who did not know the difference between good and bad work sometimes thought his prices high, and there is a story sometimes told in the shop of a man who expressed his dissatisfaction by an endorsement across the face of his check that was not altogether complimentary. As he afterward sent in a number of engines "to be fixed the same way you did that first one," after he had used the first one for some time, it appeared that he had received some information as to the difference.

As the business grew, and a foundry was added, Mr. Reid began to make such things as were needed in the production and refining of oil. Whenever he saw a need he set about trying to design something to fill it. Trying to pump small oil wells with a steam plant has as many drawbacks as trying to use low grade ore and charcoal in making pig iron, and as gas was plenty he turned his attention to the gas engine. After investigation as to the state of the art he decided that the Clerk cycle had in it the germs of the engine most suited to oil country conditions, even though the man whose name it bears had given it up. He believed that the defects in it were due to the mechanical design as used by Mr. Dougald Clerk, and not to the cycle. The cycle he believed, and still believes, has many points of superiority over any other in use.

A description of the engine naturally precedes a description of the plant, as the plant exists to build the engine. In the first place, a two-cycle engine of this type has the following advantages for the difficult and varying work demanded in the oil fields. It has an ignition every revolution and hence is not as liable to stop as a four-cycle engine. If the governor is arranged properly, when the engine is overloaded it will slow down but will not stop, in this manner behaving like a steam engine, and this is a very important point in the case of engines which must be operated with comparatively unskilled labor. Another advantage of this engine is that it is possible to operate it under a very great variety of mixtures and still have it go. Of course it will only show its greatest economy when the mixture is made in the correct proportions, and it is then equal to the best under the same conditions of speed and load, but it is very important indeed that the engine should always go, reliability being far more important in such a case as this than is the highest economy in the use of gas. There are records of these engines having run for several months without a stop. Another very important point

is that by properly manipulating the mixture and the cut off, the speed of the engine may vary through very wide ranges. For instance, at one time, a user of an engine complained that the governor was not sensitive and investigation showed that he was running an 8 h. p. engine which was designed for 175 revolutions per minute at 61¼ revolutions per minute, or in other words, at practically one-third of its speed. In another case, a 15 h. p. engine designed for 160 revolutions per minute was found running at 350 revolutions per minute, at which speed it was doing its work very satisfactorily to the owner.

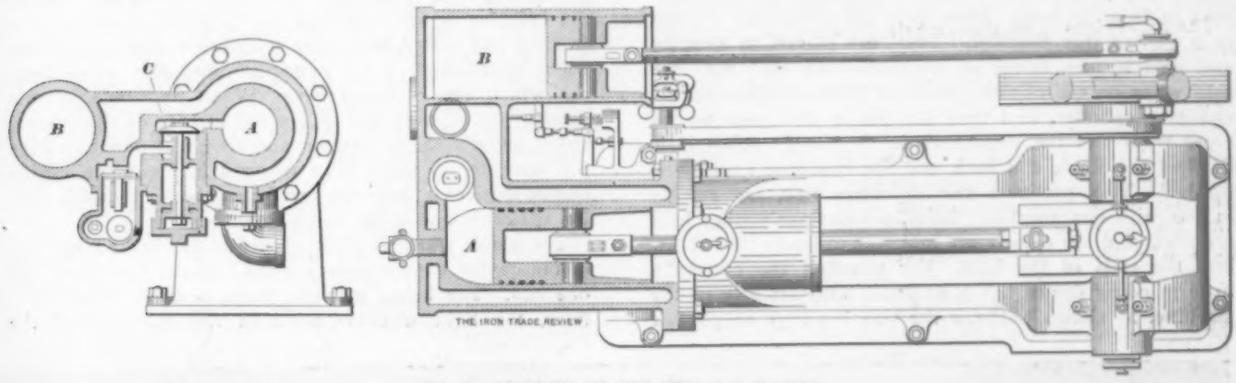


FIG. 2.—SECTIONS OF THE REID GAS ENGINE.

A cross section of the engine is shown in Fig. 2. In his design Mr. Reid eliminated all joints that could possibly be dispensed with, so as to do away with packing, as far as possible. The main cylinder A and the charging cylinder B with all of the ports, and connections are made in one casting. The operation of the engine is as follows: The forward motion of the crank draws a charge of mixed gas and air into the cylinder B. The piston in this cylinder then slightly compresses the charge and about this time the piston in the power cylinder A has advanced to the outer end of the stroke, where it uncovers an exhaust port through which the waste gases escape, thus relieving the pressure in the cylinder. When the pressure in the power cylinder is relieved, the mixture which has been compressed in the cylinder B lifts the valve C and forces its way into the back end of the cylinder A, driving out the remaining burned gas before it, thus effectually scavenging the cylinder. The operations are so timed that the main piston closes the exhaust ports just as the cylinder is full of the mixture. The slamming of the valve C against its seat is prevented by a small dash pot at the lower end of the valve stem. The only joint about the engine which has to be packed against the explosion is that necessary for placing the valve bonnet for the valve C in place. This joint is made with a copper washer. When the engine is running the cap on the lower end of this bonnet can be removed for the inspection of the valve at any time. A view of one of the engines set up on the testing block is shown in one of the accompanying illustrations. Every engine is tested thoroughly before it leaves the works. It will be noted that the engine is very compact indeed and that all of the working parts are thoroughly protected. These engines are made to run under almost every conceivable condition, some of them using high pressure gas which has to be regulated and throttled to give the proper pressure, while in other cases the engine must suck the gas from a well, the pressure in which is below the atmosphere.

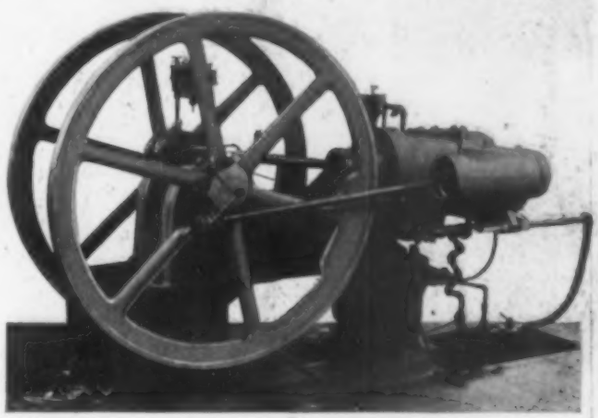


FIG. 4.—REID GAS ENGINE ON TESTING BLOCK.

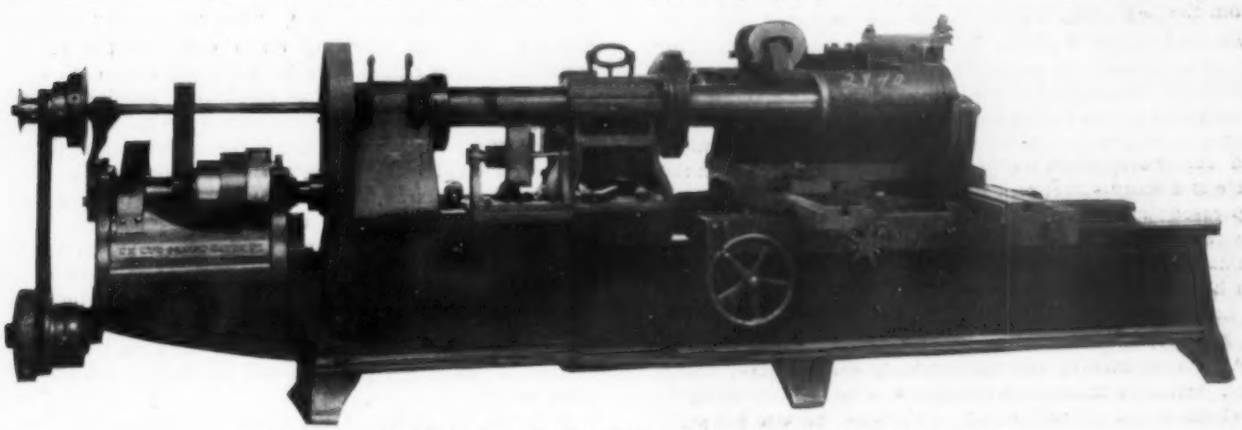


FIG. 3.—SPECIAL CYLINDER BORING MACHINE, REID GAS ENGINE SHOPS, OIL CITY, PA.

In order to produce the most accurate work possible

several special machines have been designed and built. One of these is shown in one of the accompanying views. It is used for boring the cylinders. These cylinders are of the overhanging type, and they are turned and faced, where they fit the bed, in another machine, which is also used to face the beds. After they are faced they are put in a jig on this machine. They are placed in this jig and held by the flange in the same way that they are held when on the engine. A cut is first run through the charging cylinder, and then the jig is slid over on its cross ways and the main cylinder is bored. After it is finished the jig is slid back and the charging cylinder is finished. This produces two cylinders that are exactly in line with one another. Massive cast iron boring bars are used, and the cutters are mounted in heads that screw into the ends of the bars. For grinding the cutters a little grinding device has been fitted onto the side of the machine, as shown between the two bearings supporting the spindle. The cutter heads are mounted upon an eccentric arbor hung in front of an emery wheel. One tool is ground, the eccentric reversed, and the other tool ground. The object of the eccentric is to give the proper clearance to the boring tools. The tools are made adjustable so that they can be set out to the proper distances. A set of standard snap gauges has been designed for this work, which are used to set inside micrometers for measuring the diameter of the cylinders. Each cylinder is bored as accurately as possible and a record kept of any variations which may occur, as for instance, in the record book one cylinder will be marked plus .002, another plus .006, as indicating that they have been bored that number of 1-1000 large.

By reference to this record book several other things can be seen besides the exact size of any cylinder to within a thousandth of an inch. It goes back to the starting of the cylinder in the foundry. Each cylinder as it is cast is stamped in an inconspicuous place with a number, and knowing this number enables the foundry foreman to know when it was made, who made it, and what the mixture of iron is that is in it. As a cylinder is bored it is stamped in another place with a number, and this number becomes the leading number of the record, and is turned in by the man who bores the cylinder, together with the sizes, and the foundry number. When the cylinder is finally placed on its bed and the engine finished and tested the entire machine is given a number which is stamped on the nameplate, and this is the number which the customer sees. When he sends in this number the records will give a full history of the engine, and if he only has one engine and bought it direct he does not have to do more than to send in his name. Each engine is given a thorough test before being shipped, both the indicator and brake being used.

The plant, which is of steel and brick, has a high bay in the center with a gallery extending on two sides and one end. The heavy machine work is done on the first floor, the light machine work in the gallery, and the erecting and testing at the end. Thus far no use has been found for a large traveling crane spanning the entire space, as special cranes have been located over each machine on each floor as the conditions required. The store room is located under the gallery on the side opposite the heavy machine tools, and the offices and drawing room in a building adjoining the main shops on the side next to the store room. The plant is located on the railroad, so that it has ample transportation facilities. The power plant is operated by one of the company's gas engines and is located in the basement. The blacksmith shop is now situated in a temporary building at the end of the main building. The foundry and the old machine shop, and another shop which is now used for the manufacture of pumping rigs, is located about a mile from the main works.

FIG. 5.—CYLINDER AND BED MACHINES ON MAIN FLOOR AND SMALL MACHINES ABOVE, REID GAS ENGINE SHOPS, OIL CITY, PA.

It is the intention of the company to build a large foundry adjoining the new works at some time in the future. As the business has grown, the Reid engines have been sold into other oil regions until they are now found in all the oil regions of this country. They have

a large warehouse and repair department at Marietta, O., and agencies in all parts of the oil country. One would naturally wonder why such an efficient engine, which could be abused to such an extent and still do good work, is not used to a greater extent for power purposes outside of the oil country. In discussing this matter with Mr. Platt, the superintendent, the following interesting facts came out. In an oil region every man is more or less familiar with the work of the entire district, and if one man has a machine of one kind and has used it successfully, he is always glad to assist his neighbors in getting familiar with similar appliances, hence, when a new engine is installed and is to be operated by people not familiar with it, they naturally look for help from some of their neighbors. This natural "Help-each-other" tendency very materially reduces the cost of traveling expenses and trouble men, which must be maintained by any house or any firm manufacturing a general line of power engines, for which all of the kicks and troubles are reported to the main office.

If the engine were to be pushed for general power purposes, it would be necessary to charge a price for it sufficient to cover the additional cost of maintaining such traveling experts. This would mean an engine on the market with two prices, which is certainly out of the question, and for this reason no attempt has ever been made to push the engine into commercial uses, though it is a machine that would certainly be found adapted for power purposes in many locations.

It is true that it is now used in shops, foundries, stores, mills, and all such places in the oil country, besides being the leading engine used for operating oil wells, and that it is finding its way outside of the oil country to some extent, but its extended field of operation has been due to the action of its friends who have used it in getting oil. A late patent covers its use for drilling oil wells, for which purpose it has a reversing attachment that is thoroughly reliable.

The two views will give some idea of the first old shop, which only occupied the lower part of the building shown, and of the new one. The large man in the doorway of the old shop is Mr. Reid and the young man at the extreme right is the original boy. He is now one of the company. The bushy haired boy in the doorway is a "sand rat" just beginning his foundry experience in the place which from its lack of size had been dubbed the dog kennel. He is now a very successful manager of several steel foundries. Besides these the group has produced two foremen.

The concern is now an incorporated company, and every stockholder in it is an expert in his line and actively engaged in the work of the company.

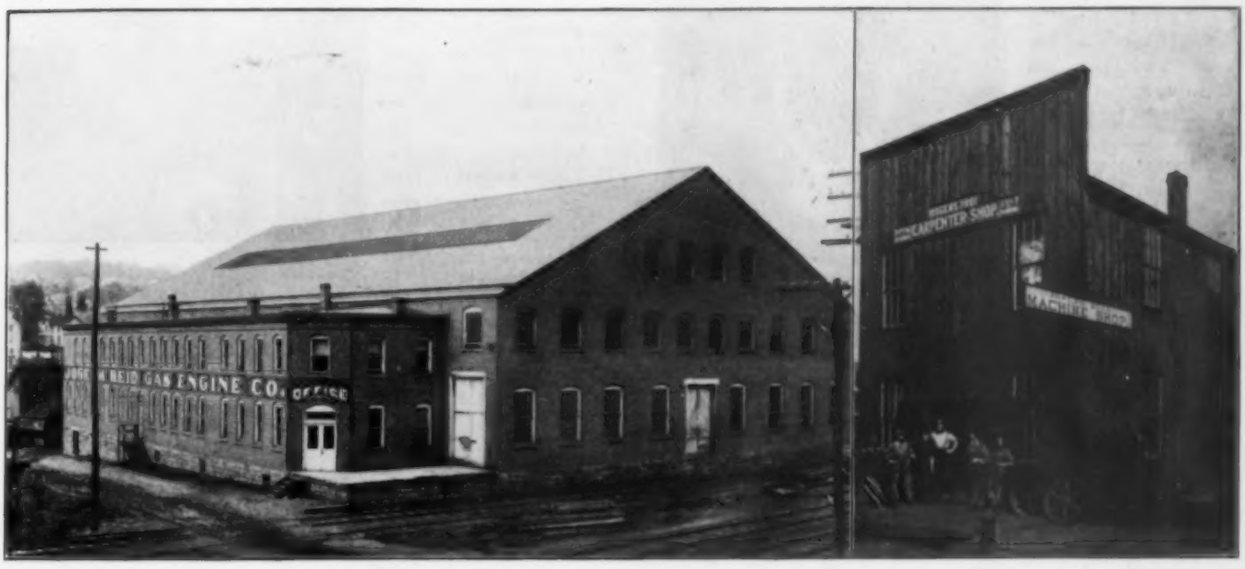


FIG. 6.—PRESENT SHOP OF THE JOSEPH REID GAS ENGINE CO., OIL CITY, PA. ORIGINAL SHOP OF THE JOSEPH REID GAS ENGINE CO., OIL CITY, PA.

FORMATION OF THE CANADIAN WHITE CO. LTD.

The Canadian White Co., Ltd., has been incorporated to carry on a general engineering and contracting business in Canada. The company is organized on similar lines to, and is associated with, J. G. White & Co., Inc., New York; J. G. White & Co., Ltd., London, and the Waring-White Building Co., Ltd., London.

The company is prepared to undertake any civil, mechanical, electrical, hydraulic and building work, and will be equipped to handle large construction contracts for steam and electric railways. It will also design, build, equip and operate electric lighting plants and power installations, gas works, water supply and sewage systems, piers, docks, harbor works, office buildings, etc. The company will not manufacture machinery, but will purchase from the leading manufacturers such materials as it requires to carry out its contracts.

The office of the company will be in the Sovereign Bank Building, Montreal.

The Associated Licensed Automobile Manufacturers of the United States met in Buffalo, July 27. Prominent members present during the first day's session were: George Pope, Hartford; E. H. Cutler, Springfield, Mass.; Charles Clifton, Buffalo; Theodore Henderson, F. B. Stevens, F. B. Stearns, Cleveland; C. A. Wardle and H. F. Lintz, New York.

J. H. Williams & Co., manufacturers of drop forgings in Brooklyn, N. Y., have moved into the new building, 260 x 50 ft., and four stories, and are overhauling the old shops, installing new machinery, improving the arrangement, etc. It is expected that within a few weeks all the departments of this largest drop forging plant in the country will be in operation to the fullest capacity.

SEMI-CENTENNIAL AT THE SOO.

HISTORY OF THE LAKE SUPERIOR IRON ORE REGION IS ISSUED

In the form of a Biography of Hon. Peter White.—An Intensely Interesting and Timely Narrative by Ralph D. Williams.

In connection with the celebration of the semi-centennial of the completion of the first great canal at the Soo, the Penton Publishing Co., Cleveland, has published, under the title, "The Honorable Peter White," a book which details the development of the Lake Superior iron country and the growth of the iron ore trade. The book is just from the press and is abundantly illustrated. Ralph D. Williams, editor of the *Marine Review*, is the author. The volume is a distinct contribution to the literature of the iron industry of the United States; not less so because it emphasizes the human and personal rather than the technical side of the industry. Mr. Williams states that three-fourths of all the pig iron that is now produced in the United States is made out of Lake Superior ore. The industrial supremacy of the United States in the manufacture of iron and steel, the output of which will probably exceed during the present year the combined outputs of Great Britain, Germany and France, is due entirely to the purity, abundance and cheapness of transportation of the ores of the Lake Superior country. The premier position which the United States now holds rests upon a very firm basis, for not for many years will these deposits be exhausted; nor indeed could they be sensibly affected in value were equally enormous deposits discovered elsewhere, since in journeying to the furnace they travel along a highway whose economy of transportation is not equaled anywhere in the world. So tremendous has the ore trade of Lake Superior grown that it seems incredible that it should be the matter of the past fifty years merely. Yet fifty years ago the rapids of the St. Mary's river acted as an insuperable barrier to commerce with Lake Superior. This great ore trade is now handled with such ridiculous ease and with equipment in the shape of ships and docks that can readily adapt itself to fluctuations from one to five million tons per month, that a truthful recital of the time when an annual stock pile of 1,000 tons at upper lake ports was considered a goodly amount, becomes extremely interesting.

RALPH D. WILLIAMS.

This book is prepared from examination of the manuscripts of the original iron mining company. In examining these manuscripts and collateral data considerable information was discovered concerning the early copper discoveries, and this information for the sake of history has been incorporated in the prologue. Iron, however, is the book's serious subject. It has been considered just to tell the story of the beginnings of the Lake Superior iron industry under the title which has been given to it. Peter White, now the leading citizen of the Upper Peninsula of Michigan, assisted, as a boy, in stripping the first iron mine. He wrote the bill of lading of one of the earliest, if not the first, shipment of ore—only six barrels, and although nearly sixty years have gone by since then, he is still active in this great iron region.

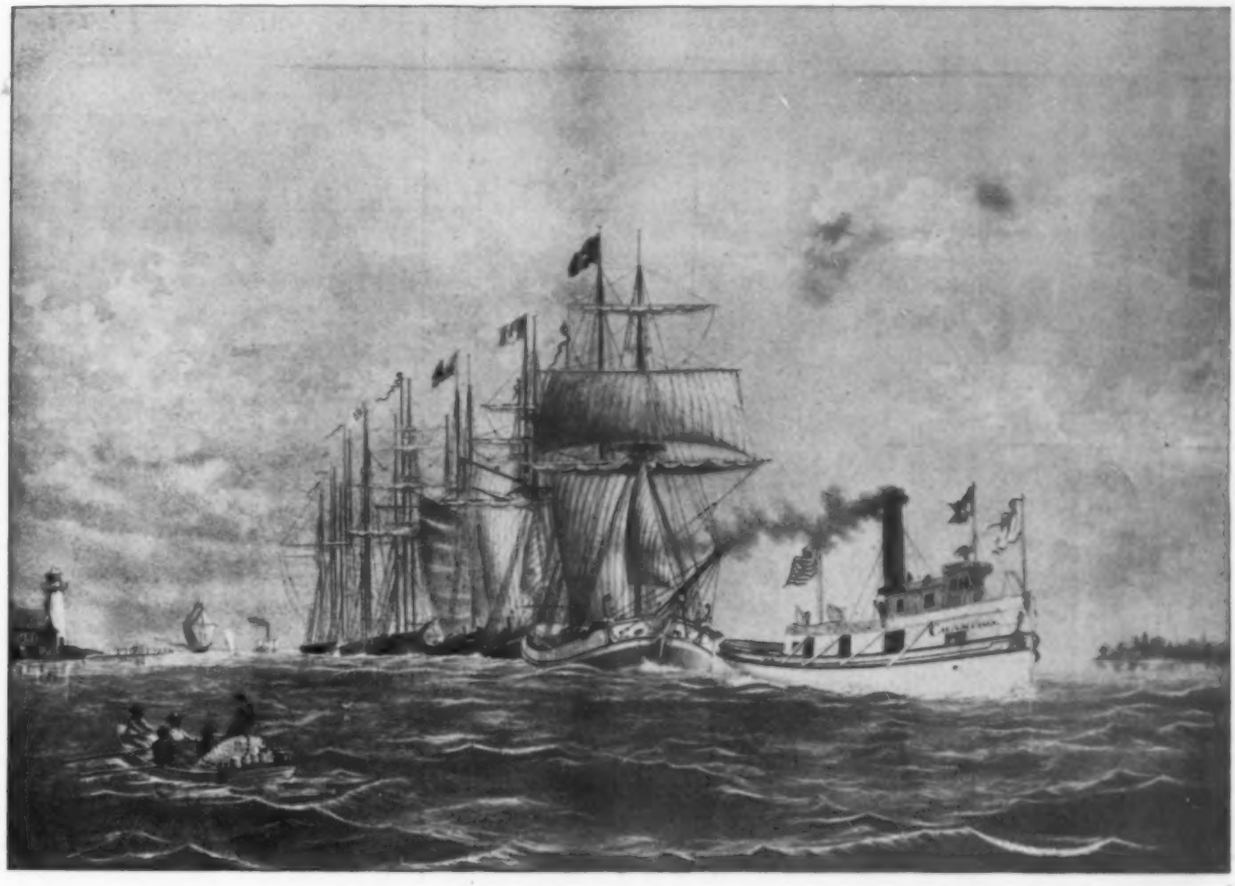
JACKSON STUMP. DETAIL OF BELOW ILLUSTRATION.

Iron ore was first discovered in the Upper Peninsula of Michigan by Mr. Wm. A. Burt, United States deputy surveyor, who was engaged in surveying the Upper Peninsula. Burt was the inventor of the solar compass and the presence of the mineral deposits was discovered by the violent fluctuations of the needle. Mr. Burt was greatly excited by these fluctuations and commanded the members of his party to search about to see what they could discover. They had no trouble whatever in discovering ore, for a mere rip of the sod revealed the mineral. The surveyors appeared to have made no effort to profit by their discovery, merely recording the findings in their field notes. They mentioned the existence of iron to Louis Nolan, a half breed, living at Sault Ste. Marie, Mich., and an Indian chief, Madjigijig, whose

ORIGINAL JACKSON MINE, SHOWING STUMP UNDER WHICH IRON ORE WAS FIRST DISCOVERED IN THE FOREGROUND.

wigwam was at the mouth of the Carp river. A year or two prior to this time the Upper Peninsula was literally overrun with prospectors searching for copper and other precious metals. No one had hitherto heard of iron. In the spring of 1845, P. M. Everett, of Jackson, Mich., accompanied by four men en route to the copper country, reached Sault Ste. Marie. He met Louis Nolan at Sault Ste. Marie, who related to him the discovery of the iron deposits by the surveyors, and volunteered to show him the ore. Everett had not heard of iron, but accepted the offer of Nolan and employed him as a guide. Nolan took the party as far as Teal lake, but was unable to locate the deposits. Everett then started for Copper Harbor, but fortunately fell in with Madjigijig, to whom he related his fruitless search, and Madjigijig immediately offered to conduct him to the deposits. The old Indian superstition was so great, however, that he would not approach the deposits directly, but merely pointed them out from a distance. He showed him the Jackson mine and the Cleveland mine. These two terms are used because it was by these names that the mines later became known. The actual discovery of the Jackson deposits were made by two members of Everett's party, S. T. Carr and E. S. Rockwell. Everett's party had a number of permits in their possession issued by the secretary of war to pre-empt mineral locations, and one of them made out to James Ganson was used on the Jackson location. The party then gathered up a little of the ore and returned to Jackson, Mich., with it. The following spring another expedition was fitted out by the Everett party, consisting of T. W. Kirtland, E. S. Rockwell, W. H. Munroe, and A. V. Berry, to visit the Jackson location. They built a house upon it and returned to the mouth of the Carp river with three hundred pounds of ore on their backs. A few of them remained behind to hold possession, but Berry journeyed on to the Sault with the ore. At the Sault Berry met Dr. J. Lang Cassels, of Cleveland, who had been sent into the Peninsula by a number of Cleveland gentlemen. Upon agreement to bear jointly the expense of making roads, Berry directed Dr. Cassels to the Cleveland location and Cassels caused it to be pre-empted. These two mines subsequently yielded millions of tons of ore.

Berry proceeded to Jackson, Mich., with his ore, where he made two attempts to smelt it in a cupola furnace, but failed. Some of the ore was then taken to Mr. Olds, of Cucush Prairie, who succeeded in making a fine bar of iron from it in a blacksmith's fire, the first iron ever made from Lake Superior ore.

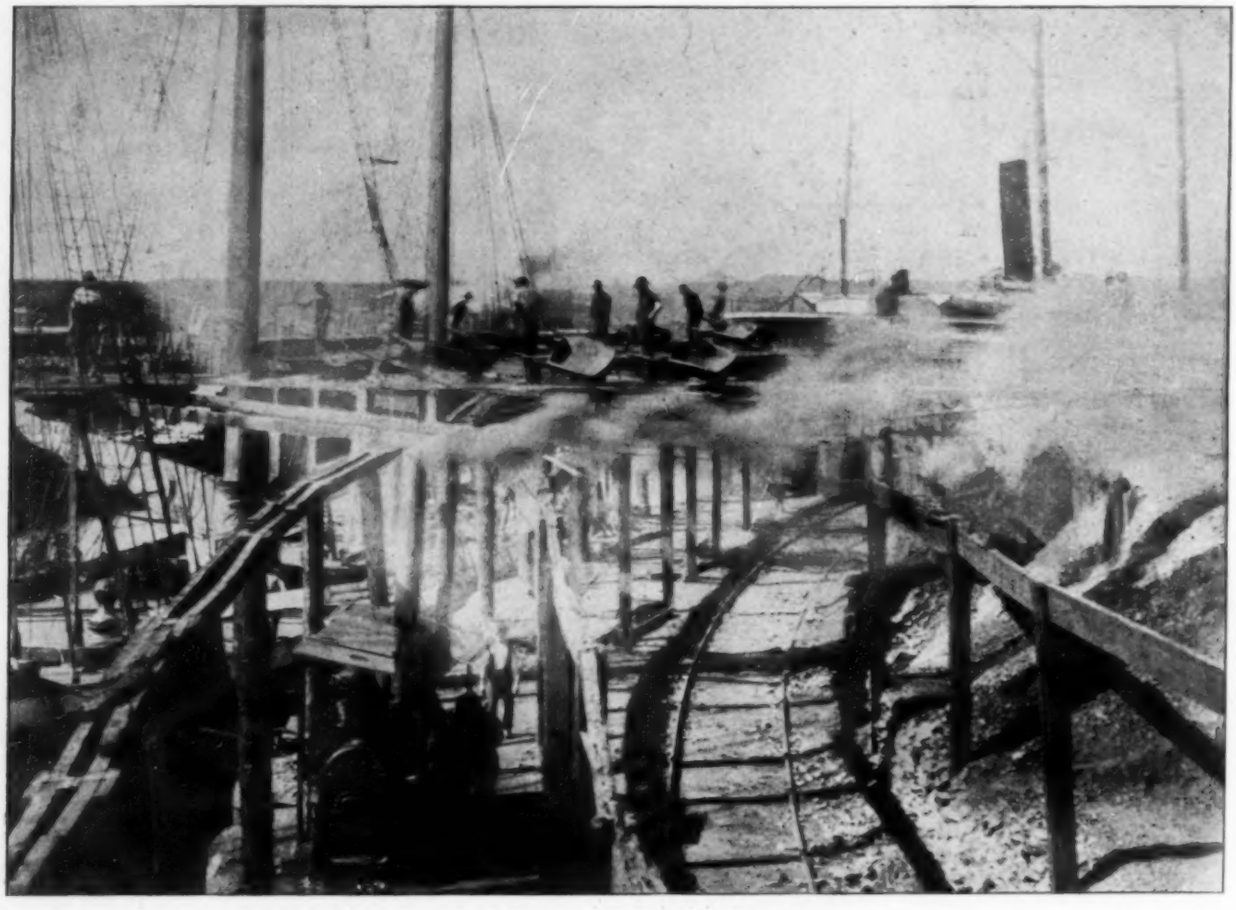


TUG CHAMPION TOWING A FLEET OF SCHOONERS THROUGH THE RIVERS. THE POPULAR METHOD OF ORE TRANSPORTATION IN THE 60'S.

In the summer of 1847 the Jackson company started a forge on Carp river, three miles from the mine, and on Feb. 10, 1848, the first iron ever made in the Lake Superior region was made in this forge by Ariel N. Barney. A month later the forge went out of commission, being carried away by a freshet. Mr. Everett returned in the spring of 1848 and repaired the dam, and resumed the manufacture of blooms. The first iron made was sold to E. B. Ward, who used it in the walking beam of the steamer Ocean. The forge had four fires, from each of which a lump was taken every six hours, which was placed under the hammer and forged into blooms 4 in. square and 2 ft. long. The daily product was six tons, requiring two teams of six horses each to convey the blooms to Marquette, which lay ten miles away. The

roads were of unvarying horror and breakdowns were frequent. The same difficulty which attended the getting of the blooms to port attended the getting of supplies to the forge, the ore and charcoal. After struggling with insufficient power, the Carp river running pretty low, with frightful grades and the unspeakably bad roads, the forge met the death to which it was born.

Robert Graveraet, who lived at Mackinaw, believed that he had a claim upon the Cleveland location and also on a third deposit which later became known as the Lake Superior mine. In March, 1849, he organized the Marquette Iron Co., composed of W. A. Fisher, A. R. Harlow, E. B. Clark, and himself, to develop these two mines. Sam H. Moody and John H. Mann were endeavoring to pre-empt the Cleveland location for him, and Dr. Edmund C. Rogers the Lake Superior location. Graveraet having organized his company, went from Mackinac Island to pointed day. The Cleveland company proved its claim to the Cleveland mine without opposition. The Lake Superior was claimed by Isaiah Griggs, who was a packer of provisions for the surveying party and who had established a shanty on the Lake Superior location for himself and his pony, utilizing it as a basis of supplies. On the strength of this residence he secured the Lake Superior deposit for John Burt. Burt subsequently gave one half interest in it to Graveraet. The pioneers of the iron mines were all possessed with the idea that the Peninsula was the logical place for making pig iron. They all attempted it, but the obstacles against its successful manufacture were insuperable. One of the causes was the impossibility of keeping sufficient stock of charcoal on hand to keep the forges running. The charcoal in those days was all burned or charred in pits. Such a thing as a charcoal kiln of brick or stone was unknown.



THE LITTLE DOCK ENGINE ON THE NYPANO DOCK IN CLEVELAND IN 1867. THIS METHOD OF UNLOADING ORE CONTINUED UNTIL 1880.

get men to develop the mines. Peter White, as a boy, was then working with Captain Augustus Canfield, who was building a lighthouse on Waugashance reef. He went to the iron mines with Graveraet, and he has remained there ever since, incidentally molding a town, since Marquette is truly his handiwork. He assisted in stripping the first iron mine and worked faithfully at this occupation for months. In the fall of 1850 all the preemptors gathered at the land office at Sault Ste. Marie to prove their claims to the deposits. Sam Moody and Dr. Rogers had left Marquette in a small boat to claim the Cleveland and Lake Superior deposits. They were becalmed and did not reach Sault Ste. Marie on the ap-

Then again the hauling to the shore of the lake was expensive and the unloading at the Sault for portage over the rapids was also expensive. By the time the bloom iron had reached Pittsburg it cost $200 per ton to make while the market price for iron at that time was $70 per ton. It began to dawn on the pioneers that the real business of the Peninsula was the shipping of the ore itself to the lower lakes. This operation also was attended with great difficulty. Nothing but an Indian trail extended from the shore of the lake to the mine. The crude wagon road which had been hewed through the forest would not bear so weighty a substance as ore in the summer time. The summer time was, therefore,

devoted to mining the ore and the winter to hauling it in sleighs to the shore of the lake. The sleighs held about a ton each, and it was impossible for a team to make more than one trip a day. The records of the Cleveland Iron Mining Co. show that eighteen tons were hauled one day, which, added the agent, "is the biggest day yet." If by spring time a stock pile of 1,000 tons had accumulated on dock it was accounted a large amount.

In 1852 the iron companies began the construction of a plank road to the mines. It was at this time that Peter White wrote the bill of lading of one of the earliest shipments of ore of the Lake Superior country. It consisted

THE OLD CHARCOAL KILNS NEAR NEGAUNEE.

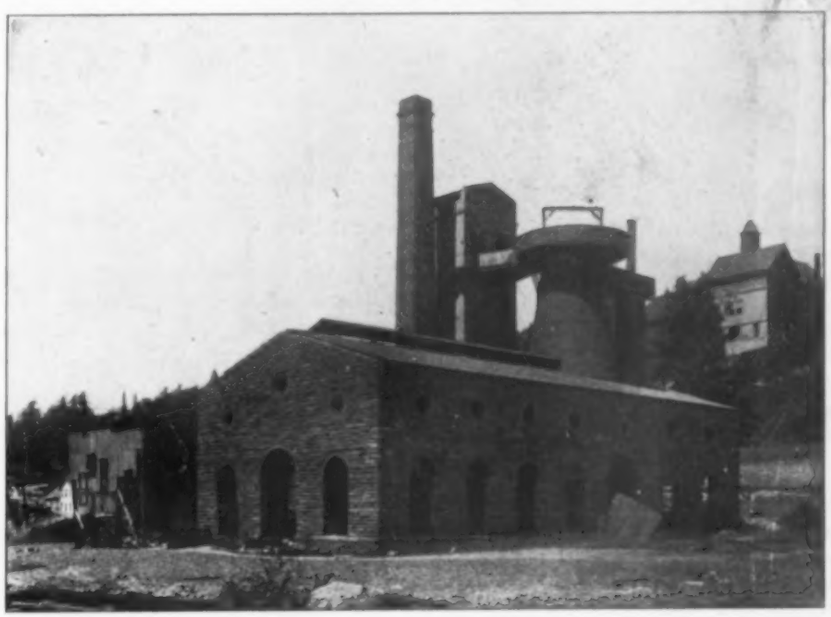
of six barrels, consigned to B. L. Webb, Detroit, who at that time was secretary of the Jackson Iron Co. The ore was shipped to Sault Ste. Marie on the steamer Baltimore. Prior to this time it was reported that some five tons had gone forward to A. L. Crawford, Newcastle, Pa. In the fall of 1853 about 150 tons of iron ore were sent forward by the Cleveland Iron Mining Co. to the furnace of the Jackson Iron Co. at Sharon, where it was tested in the blast furnace. It made a superior grade of iron, but it is doubtful if it was smelted successfully so far as the blast furnace was concerned, as it left the furnace in very bad shape. However, its quality was undoubted, and the iron companies determined to convert the plank road into a strap railroad. Meanwhile construction had begun on the canal at Sault Ste. Marie. Energies were bent to complete the strap railroad before the canal should be opened, but as the strap railroad was not completed until November, 1855, the canal was actually finished several months ahead of it. The first shipment of ore through the canal was on the brig Columbia on August 17, 1855, and consisted of 132 tons, which was shipped by the Cleveland Iron Mining Co., consigned to the Cleveland Iron Mining Co. In point of fact, all the ore that left the Peninsula that year, 1,440 tons, was shipped by the Cleveland Iron Mining Co., the other two companies, the Jackson and Lake Superior, not being prepared to ship any ore at all. This old strap railroad led a very strenuous life indeed for two years. All the motive power was mules, and the cars held about four tons each. The mules, however, could make only one trip a day. The grades were simply frightful, and the cars sometimes ran away, mangling the mules and jumping the track at the first curve. Heman B. Ely had begun the construction of a steam railroad to the mines, and when Congress passed the Land Grant Act to stimulate the construction of railways, the iron companies made overtures in September, 1857, to consolidate their strap railroad interests with Ely's steam railroad interests. The first two locomotives used upon the road were named the "Sebastapol" and "C. Donkersley." These two locomotives were the first to be used in the Peninsula and were built by the New Jersey Machine & Locomotive Works, Paterson, N. J. These locomotives were capable of hauling 1,200 tons a day, which was termed in the newspapers of the time "an avalanche of ore."

It is interesting to recall that the furnace men of the early days had great difficulty with Lake Superior ores in the furnace. It must be remembered that the blast furnaces of those days bore little relation to the blast furnaces of to-day. It has been related that about 150 tons of ore were shipped to Sharon by the Cleveland Iron Mining Co. In 1853 it was landed at Erie, Pa., and sent by canal to Sharon. The first boat load was delivered at Sharpsville furnace owned by David and J. P. Agnew. Describing the event David Agnew wrote:

"The ore was used in the furnace partly alone and partly in mixture with native ores, and the experiment was highly successful, the furnace working well and producing an increased yield of metal which was taken to the Sharon Iron Works and there converted into bar iron and nails of very superior quality." The second boat load was also brought to Sharpsville, but having been intended to be left at the Clay furnace, owned by the Sharon Iron Co., was returned and used at that establishment.

Mr. Frank Allen, manager of the Clay furnace, has also insisted that the initial work on Lake Superior ore at the Sharpsville furnace was not a success. In a letter to the "Sharpsville Advertiser" he wrote:

"On the last day of November, 1853, one of the proprietors of the Sharpsville furnace said to me that they had tried more experiments with that ore than had been



GRACE FURNACE, MARQUETTE, MICH. DESIGNED FOR ANTHRACITE. BUILT IN 1871.

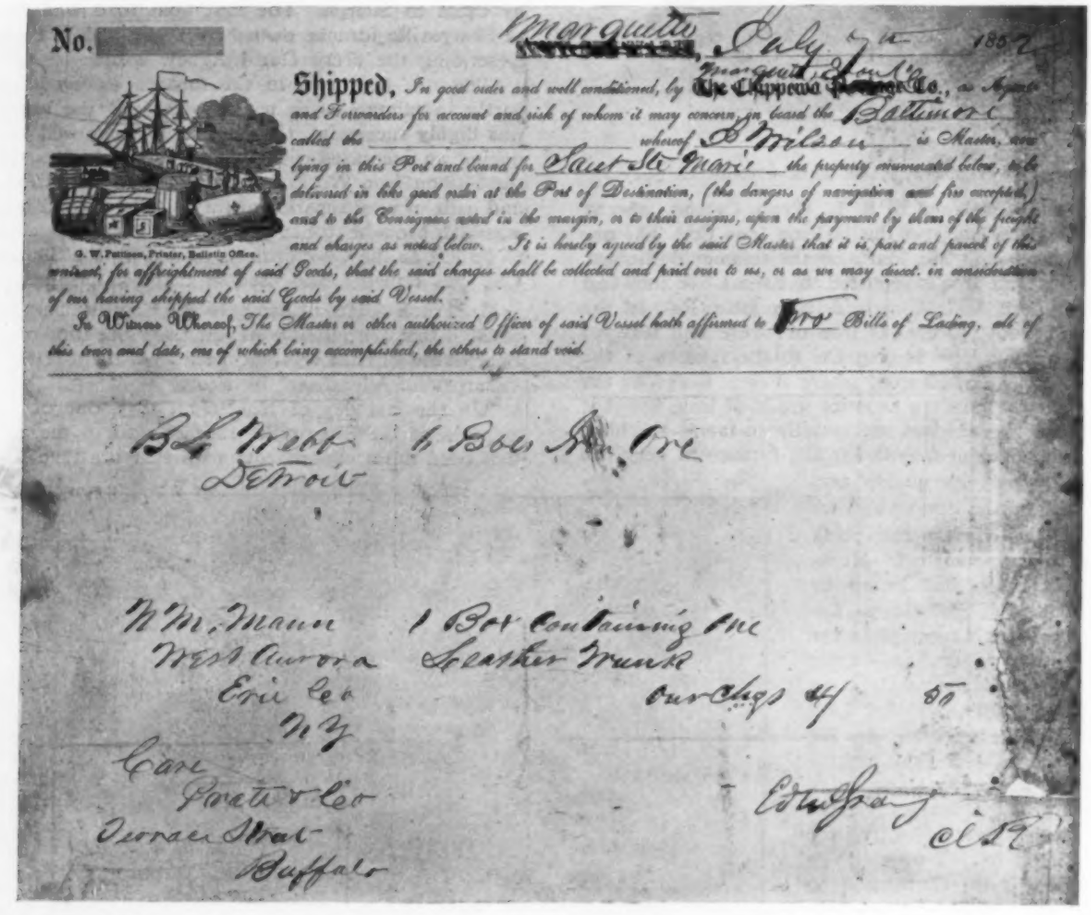
profitable and that they would never put another pound of it into their furnace. The same day Samuel Clark boated a load of the ore from the Sharpsville furnace to the Clay furnace landing. We put it through the furnace and sent the product to Sharon. The next season all the Lake Superior ore left over at Sharpsville furnace was sent over to us, and during the years 1854-55 and until August, 1856, we had used in all about 400 tons of Lake

Superior ore, some of it alone but most of it mixed with other ores and up to that time the working of it was not a success. In October, 1856, we gave Clay furnace a general overhauling, putting in a new lining and hearth, and made material changes in the construction of the same, put her in blast late in the fall and in a few days were making a beautiful article out of iron from Lake Superior ore alone, and this was then considered to be the first real and successful working of Lake Superior ore in a blast furnace."

When Mr. David Agnew saw this article in the newspapers he replied as follows:

"I have no desire to engage in newspaper controversy with Mr. Allen in regard to the first successful working of Lake Superior ore in the blast furnace; still I cannot let this article pass unnoticed. I should have replied subject to a long wagon transportation. This ore we worked in our furnace very satisfactorily. Indeed our furnace never gave better results than while working this ore. We commenced by charging one-fourth Lake Superior and three-fourths common ore. The iron thus produced was worked at the Sharon rolling mill into boiler plate, bar iron, nails, spikes, etc., samples of which were shipped to New York and there submitted to the usual tests, and declared to be of the very best quality.'

"So much for my brother's statement. In regard to the shipment of Lake Superior ore from Sharpsville to the Clay furnace, I have to say that the second shipment of lake ore to Sharpsville was in mistake. The Sharon Iron Co., having purchased Clay furnace, wished to work the ore there, and directed it to be left at that furnace landing but the boatman by mistake brought it on to


No. [redacted] Marquette, July 7th 1852

Shipped, In good order and well conditioned, by The Chippewa [illegible] Co., as Agents and Forwarders for account and risk of whom it may concern, on board the Baltimore called the _____ whereof D Wilson is Master, now lying in this Port and bound for Sault Ste Marie the property enumerated below, to be delivered in like good order at the Port of Destination, (the dangers of navigation and fire excepted,) and to the Consignees noted in the margin, or to their assigns, upon the payment by them of the freight and charges as noted below. It is hereby agreed by the said Master that it is part and parcel of this contract, for affreightment of said Goods, that the said charges shall be collected and paid over to us, or as we may direct, in consideration of our having shipped the said Goods by said Vessel.

G. W. Pattison, Printer, Bulletin Office.

In Witness Whereof, The Master or other authorized Officer of said Vessel hath affirmed to Four Bills of Lading, all of this tenor and date, one of which being accomplished, the others to stand void.

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1 Box Ass. Ore

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1 Box containing One
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Our Chgs 44 80

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Foster & Co
Dennis Wharf
Buffalo
Edw Jay
Clerk

FAC SIMILE OF BILL OF LADING OF THE FIRST SHIPMENT OF ORE. THIS BILL OF LADING IS IN PETER WHITE'S HANDWRITING.

sooner but wished to hear from my brother, J. P. Agnew, before doing so. My brother and myself were the proprietors of the Sharpsville furnace at the time referred to. He writes:

"I notice Mr. Allen's article published in the Sharpsville paper and am greatly surprised at its contents and am sorry to have to contradict his statements. All the circumstances connected with that event (the working of the ore) are as fresh in my memory as if they had transpired within the last month. By arrangement with Gen. Curtis, president of the Sharon Iron Co., and at his desire, as well as our own, a quantity of the ore (I think about thirty tons) was ordered, which, however, cost about as much as pig iron was worth at the time, being Sharpsville, from whence it was reshipped to Clay furnace for the reason stated and that only. Now, in view of all these facts, am I not justified in claiming that D. & J. P. Agnew were not only the first to use, but to use successfully, Lake Superior ore in the production of pig iron?"

Mr. Allen then grew earnest and wrote:

"I have very repeatedly said within the last twenty years that Lake Superior ore was never successfully worked in a blast furnace at Sharpsville, Clay furnace or elsewhere in the Shenango valley until it was done at Clay furnace late in the fall of 1856. And now I repeat it again with emphasis. I know that it was not done at Clay furnace, and will briefly state why I believe that Agnew brothers did not work it successfully at Sharps-

ville. On the morning of Nov. 30, 1853, the late Gen. J. B. Curtis, president of the Sharon Iron Co., did, at their office in Sharon, and in the presence of Mr. D. Agnew (then bookkeeper for said company) say to me, 'I have this morning sent Sam Clark to Sharpsville with his boat to get a load of that cursed ore and take it to Clay furnace landing, and want you to put it through the furnace and send the iron from it here, that we may have it made into iron and nails, before the annual meeting of our stockholders, which was soon to be held.

CLARKSBURG FURNACE. BUILT IN 1866.

"I replied to him that the road from the furnace to Canal landing had been so badly cut up by hauling over it, and now partly frozen, that it was now almost impassable, and said to him: 'Why not have Messrs. Agnew put it through their furnace and save hauling ore and iron over such very bad roads.' Here and then Mr. David Agnew turned from the table on which he had been writing, and said: 'We have tried more experiments with that ore than has been profitable, and will never put another pound of it into our furnace,' and I verily believe that they never did use any more of it."

"I then started for home and without stopping at the furnace, rode on to the canal landing, engaged John Buchanan to assist me in placing plank to unload onto, and left him there to help Mr. Clark unload his boat when he should arrive. The same evening I reported to Mr. C. Davis, our founder, that there would be a load of Lake Superior ore at the landing some time during the night, and also that Gen. Curtis' instructions were to put it through the furnace without delay. Here I encountered very strong opposition, Mr. Davis refusing to have it put into the furnace, saying that it had never been and could not be worked into a blast furnace successfully; that he had blown the Sharon furnace for Mr. Agnew a few years previous; had been at Sharpsville repeatedly since the ore had been received there, and knew all about the success they had had with the small amount worked in their furnace, and finally closed by saying that if Gen. Curtis wanted a boat load of that ore put through Clay furnace he might come and direct the putting of it in himself, and if he stayed until it came out in the shape of pig iron he would stay a long time. I replied that Gen. Curtis' orders must be obeyed, and if the furnace chilled up or was lost on account of using the ore we had nothing at stake and would not be blamed. He said: 'I have my reputation as a founder, and I prize it as highly as Gen. Curtis does his money.' And thus we parted for the night.

GREENWOOD FURNACE. BUILT IN 1864.

"On the fifth of December, 1853, we commenced using the ore, put in a few charges mixed with native, and then charged with Lake Superior ore alone. Were glad when it was all done. Mr. Davis and I were well satisfied that if there had been much more of it the furnace would have been in bad condition. It took several days to get the hearth clear as it was. We sent seventeen tons of the iron to Sharon. I also attended a meeting of the stockholders above referred to, and there, in the office of the company found a large amount of iron, nails and spikes of a superior quality, said to have been made from the Lake Superior iron we had sent there a few days previous. During the years 1854-55 we worked several hundred tons of Lake Superior ore, but not successfully. When charging the furnaces with Lake ore alone we could run but a few days, and then resorted to mixing; and as regards the quality of iron made it was not considered good for forge purposes, which I doubt not Mr. D. Agnew recollects. I well remember of once receiving an order from the Sharon Iron Co. for a boat load of our best mixture, and we shipped it by Capt. Pat Sullivan, selecting the very best we had. The next day while eating dinner the captain called at the door, and for a few minutes it was nothing but 'them d—d fellows at the mill, and Gen. Curtis and Mr. Agnew and that d—d iron.' He handed me a letter from Mr. Agnew, the contents of which as near as I recollect, was this: 'Mr. Allen—The iron you sent us is not suitable for our purpose. We sent it back. Either have it unloaded at the landing or send it to Erie as you think best.' Having plenty of the 'd—d' mixture on hand we gave Pat a new shipping bill and he went on his way rejoicing.

"In the fall of 1856 at the request of Mr. Samuel Kimball, president of the Sharon Iron Co., I fitted Clay furnace up with a new lining based upon my experiments of three years back. We blew in about the last of November, and immediately after the statement of our first weeks' work had been received by Mr. Kimball, of Cleveland, Mr. Garrett and Dr. Hewitt came to Sharon. Gen. Curtis brought them to Clay furnace in his carriage and the first thing Mr. Garrett said to me was, 'Mr. Kimball has shown us your weekly statement about the working of Lake ore in his furnace, and we don't believe it correct. We don't want to be humbugged any more about this matter and will stay with you until we are satisfied that you are not trying to fool anybody.' They did stay until they were satisfied that all was right.

MUNISING FURNACE. BUILT IN 1868.

"In a short time many of the eastern stockholders of the Sharon Iron Co. paid us a visit, the late Major M. C. Trout with them. I cannot name all of them now, but among them was Mr. Oliver of Philadelphia, Shelton of Connecticut, Greer, Hix and Cook of New York. They remained with us one day, and were wild with excitement, as well they might be. The great problem had been solved. Lake Superior iron ore had been for the first time successfully worked and the large amount they had invested in it would not be lost. And how was it with us poor devils at the furnace who had been working for three long years to accomplish this great and grand result? We felt like new men. Instead of cursing Lake Superior ore and wishing it safely landed in hell, or some other seaport, the more that was sent to us the better we were pleased.

"And now a few words in reply to Mr. Agnew's article and I have done. He said he worked thirty tons Lake Superior, mixed with native ore and while so doing changed the burden four times and was satisfied with the result. I would like to know why he did not use more of it—at least the balance that he had burnt and fitted ready to put into the furnace. Was this a mistake to have a large amount burnt when there was but a few tons to be used? If so, to say the least it was a foolish waste of labor and fuel. And right here I would say to J. P. that there are men living that worked at the furnace while this puny test was being made whose recollection of the success attending it differs very materially from his.

"The fact is that previous to November, 1856, all furnacemen that had tried Lake Superior ore were in the fix the family were that ate the cat. When they had taken a mouthful apiece all around they wanted no more. I cheerfully accord all credit to the Messrs. Agnew for having worked thirty of the first 429 10-10 tons of Lake Superior ore shipped into this valley, yet contend that there was not enough used (and it was mixed with other ore) to satisfy any practical furnacemen that the test thus made had been thorough and successful. What! Thirty tons if used alone would not fill a furnace half full, and not more than enough to last one of our furnaces fifteen hours when in full blast. Is there a man on earth that would invest his money in building a furnace for the purpose of working ore that had been thus tested and thus only? No. You might as well put it through a coffee mill, then into a pepper box, shake it over the trunnel head once a day for a week, and then come to him and say that the ore had been worked successfully in a furnace and the iron made from it A No. 1."

The extended remarks of Mr. Allen caused Mr. David Agnew to make the following reply:

"I presume Mr. Allen will admit that the first attempt to use Lake Superior ore in a blast furnace was made at the old Sharpsville furnace. If so, the only matter in controversy is: Was the result of that trial successful? My brother who was in charge of the business, was present at the time and had therefore the best means of knowing the fact, says: 'This ore was worked in our furnace very satisfactorily. Indeed our furnace never gave better results than while working that ore,' and proceeds to state how the ore was used, the quality of the iron, etc. Does this indicate failure? But Mr. Allen says that in the presence of himself and Gen. Curtis I acknowledged the experiment to be a failure. Admitting that such an interview took place, of which I have no recollection, still Mr. Allen must have entirely misapprehended the language used on the occasion. I believed then and have ever since believed that it was a success. That I should have asserted the contrary is not at all reasonable. The great cost of the ore, as explained in a former communication, was of itself a sufficient reason for not wishing to continue the experiment any longer than to prove its adaptation to furnace use and to judge of the quality of the iron. Both these objects were demonstrated to our entire satisfaction. We could not have continued the experiment if we had desired to do so, from the fact that the second shipment of ore was intended to be used at Clay furnace, owned by the ore company, and was consequently reshipped from Sharpsville (where it was brought in mistake) to Clay furnace for that purpose. Mr. Allen ridicules the idea that any correct opinion could be formed of the working, or of the metallic qualities of the ore from the small quantity employed. I readily admit that such a quantity of ore in one of our present furnaces, yielding thirty to forty tons per day, would afford no proper test of its quality in either of these respects, but the trial under consideration was made under entirely different circumstances.

"The average product of the Sharpsville and other furnaces in this valley at the time of this experiment was only about four tons per day. Thirty tons of Lake Superior ore mixed with the common ores, as explained in my last, was sufficient to produce at least thirty tons of metal and allowing one or even two tons per day additional for the increased percentage of iron in the mixture would supply the furnace for five or six days. Will Mr. Allen say that such a trial affords no ground on which to base a correct opinion of the result? I have no desire, nor is it necessary to impugn the veracity of my worthy friend. He evidently got a wrong impression in the beginning, hence the error into which he has fallen. Having as I think presented sufficient evidence of the fact that my brother and myself were the first to use, and to use successfully Lake Superior ore in the production of pig iron, I now take leave of the subject with the kindest feelings for my respected but mistaken competitor for that honor.

"DAVID AGNEW."

Mr. Allen concludes the controversy with the following letter:

"If our respected friend, D. Agnew, Esq., thinks that his last article will satisfy any practical furnacemen that the working of Lake Superior ore in the old Sharpsville furnace under his administration was a success he is mistaken. We, at Clay furnace, succeeded much better with the first boat load, sent us in December, 1853, as we worked enough of it alone without mixing other ores, to produce fully seventeen tons of iron, and while doing so, did not have to cast over the dam. And yet we know, neither of the furnaces in the shape they were then, could have been run on Lake Superior ore alone two days in succession successfully. To prove this fact we have only to refer to Mr. Agnew's article. He says it took them six days to put thirty tons through the Sharpsville furnace, making about four tons of iron per day. Now why was it that this same old Sharpsville furnace in 1859, under the management of John J. Spearman, Esq., and being no larger or better than when Agnew owned her, was making from twenty to thirty tons of excellent iron per day (as much in a day as Mr. Agnew could make in a week). It was simply this: Mr. Spearman in having her fitted made the changes in the shape of lining, hearth and bosh, that we adopted at Clay furnace in 1856 when Lake Superior ore for the first time, was successfully worked in a blast furnace without mixing.

"As stated in a former article we wish to accord to Mr. Agnew all honor for having worked thirty tons Lake Superior ore mixed with native ore, and that, too, before any Lake Superior ore had ever been received at Clay furnace, even if it did take six days. And we now say that if it had taken six months to get this trifling amount through their furnace we would still be willing to give them all praise for having done it. We spent three years at Clay furnace experimenting with lake ore, and notwithstanding the fact that during the whole of that time we succeeded much better than Mr. Agnew ever did at Sharpsville, we never worked it successfully until the fall of 1856."

The following letter corroborative of Mr. Allen's contention was received from J. J. Spearman, owner of the Sharpsville furnace:

"The first Lake Superior ore worked in the Shenango Valley was at the old Sharpsville furnace, then operated by D. and J. P. Agnew, only a small quantity was used in a mixture of native ores. The first Lake Superior ore worked alone was at the Clay furnace (now abandoned).

This furnace was owned by the Jackson Iron Co. and managed by Mr. Frank Allen. This furnace was the first in the Shenango Valley and as far as I know in the United States to use alone and successfully work any large quantity of Lake Superior ore."

It is quite well authenticated that the first person to manufacture iron from Lake Superior ore in Ohio was Chas. T. Howard, proprietor of the Falcon Iron Works, at Youngstown. Howard's first order was for 500 tons at $8 per ton, and was placed with the Cleveland Iron Mining Co. in August, 1856. He had no difficulty whatever in smelting, saying it worked nicely from the start, improving the quality of iron by giving it body and very much increasing the output of the furnace per day, and making the cost per ton for labor less and the iron more salable as well.

No sketch of the Lake Superior country would be complete without reference to the iron making industry as distinguished from ore mining. As a merchant dealing in pig iron Peter White made money; but when he invested his little capital in enterprises for the manufacture of pig iron, he like all the rest, lost. The time was not ripe for iron making in the peninsula. There was no consuming population within the limts of its natural market.

The first pig iron produced in the Lake Superior region was made in 1858 by Stephen R. Gay, who leased the forge of the Collins Iron Co., and converted it in two days at an expense of $2 into a miniature blast furnace. The forge of the Collins Iron Co. was the third to be established in the Lake Superior country, having been built in 1854 by Geo. B. Russel and others. The two which had preceded it were the forges of the Jackson and Marquette iron companies as related in the prologue of this story. The pig iron produced by Mr. Gay was, of course, purely experimental. The first blast furnace in the Lake Superior region was built by the Lake Superior Iron Co. at what is now the city of Negaunee. It was called the Pioneer furnace. Work upon the furnace was begun in June, 1857, and was finished in February, 1858. Mr. E. C. Hungerford was the agent and Stephen R. Gay, superintendent. The circular issued to stockholders of this company at the time of its formation called attention to the quality of iron made from Lake Superior ores in the little Catalan forges. It will be understood that all of the first iron made in the peninsula was what is known as blooms. This is a form of wrought iron made in open fire by charcoal and brought into shape under the trip hammer. Iron drawn from these blooms had undergone various tests but by far the most significant test of its breaking strength was that recorded by D. B. Martin, engineer in chief of the United States navy, to J. C. Dobbin, then secretary of the navy. His report was brief as follows:

"A piece was drawn down to one half inch diameter (round) made into a chain link, tested in the chain proving machine and broke at 75½, or 169,120 pounds."

The force of this test can be appreciated when it is known that the British admiralty proof of chain cable at that time, of which the round iron is seven-eighths of an inch in diameter, was fourteen tons, and the American proof chain of the same dimension was fifteen tons. The piece of iron tested by Chief Engineer Martin, therefore, was more than five times the proof test required of chain link of nearly twice the diameter. Think of the sensation which Chief Engineer Martin must have received. The chain should have broken before the weight had reached twelve tons. The wonder grew as the weight increased from ten to twenty, to thirty, to forty, to fifty, to sixty, to seventy tons, and yet the chain withstood it until five and one-half more tons were added. The test established a new breaking strength for iron.

The circular of the Pioneer Iron Co. was as glittering as the modern prospectus. The circular stated that the company controlled 4,134 acres of timber land which "at the usual estimation that a cord of wood will produce 40 bushels of charcoal of which 125 bushels will furnish fuel to melt one ton of iron and assuming that each acre will vield sixty cords of wood, the company's lands will furnish fuel for nearly 80,000 tons of iron ore, sufficient to supply two stacks for ten years." The circular estimated that the cost of making iron would be $19.75, delivered at Chicago, and the cash price for charcoal pig being then $38, the profit would be $18.25 per ton. With this very encouraging prospect the directors felt bold enough to announce that they intended to erect that year (1857) one stack capable of turning out ten to twelve tons daily.

The first stack of the Pioneer Iron Co. went into blast in April, 1858, and the second one in May, 1859. The prospects of large dividends, however, were rudely shattered. The annual report issued in September, 1859, stated that beside the capital fully paid in on $125,000, a floating debt of $95,000 had accumulated and that the company was losing money on every ton of iron turned out. The quality of its charcoal iron, however, was above criticism.

A number of other furnaces followed the Pioneer, being located at various points with reference to different advantages for the manufacture of iron, one locating near a belt of hardwood, another near a limestone quarry, a third near an ore deposit and a fourth to secure the benefit of water privileges.

The furnace history of the upper peninsula, however, has been one of general abandonment, the Pioneer being the only one of the early furnaces to have survived. One can wander into the wilder portions of the Marquette range to-day with a feeling that no one has ever penetrated that portion of the wilderness and suddenly come upon the remains of an old charcoal furnace with its battery of ruined kilns, embankments and roadways—mute testimonials of earnest but unrewarded effort.

In his epilogue, the writer says:

"A review of Peter White's life would be a review of the history of the Lake Superior country. His life compasses all that is modern in the history of that princely territory—the richest in a mineral sense that has ever been discovered. The only part of it which his life does not embrace is the pre-industrial period. What antedates him is largely legend or fragmentary exploration. and even of this history he has gathered as much as he could and preserved it in the imperishable pigment of prose. But it is because he has lived throughout the entire industrial era that his life has great historic value. The changes since he ripped the sod off the iron ore of the Cleveland mine in 1849 have been vast. That blow altered the face of a continent. Instead of the stubborn and rebellious mule hauling a four-ton car on a little strap railroad there is now plying to this self same range some of the most powerful locomotives ever constructed, and the freight traffic along the old roadbed is among the heaviest in the world. Instead of a 100-ton schooner receiving its cargo of ore upon a gang plank there is a 10,000-ton steamer being loaded by means of a trestle dock with its pockets and chutes in far less time than it took to load the little schooner—and all coming from the self-same deposits. To be exact, the great steamer Augustus B. Wolvin has loaded 10,245 gross tons of ore at the Great Northern docks, Allouez Bay, in 89 minutes. Nine thousand tons of this load were put on in 24 minutes and the Wolvin was at dock

a total period of only 180 minutes, which included shifting. Instead of the old strap railroad at the Portage and Sheldon McKnight with his old gray horse, there is the great Sault Ste. Marie canal, whose traffic is more than three times as great as that of Suez, the ungated highway to nations that were old before the dawn of history. Instead of the painful loading and unloading of cars by human labor there is the steam shovel, the drop bottom car and the great unloading machines and automatic buckets. Instead of an annual output of 1,449 tons, there is an average yearly output of over 20,000,000 tons, with the probability of the output reaching 30,000,000 tons during the present year; instead of a freight rate of from $3 to $6.25 per ton from Marquette to Ohio ports as it was in 1866, there is the present trip to trip rate of 75 cents and a contract rate over a term of years of even less than that figure. The Ocean, the Fur Trader, the Algonquin, the Baltimore and the Mineral Rock, have given way to an ore-bearing fleet of steamers, rivaling in dimensions and carrying capacity the great Atlantic liners. Witness the ore-laden fleet as it passes out of Duluth harbor; follow it a little down the lake until it joins the squadron emerging from Two Harbors, to be joined by a third defiling from Ashland. Eastward they sweep, uniting with the old guard at Marquette, bearing down upon the Sault in a mighty throng, staggering the imagination to believe that they are plying waters that knew only the birch bark canoe scarcely half a century ago. Ask what genii is it that has rubbed Aladdin's lamp to such purpose, and the answer is Iron. Onward they sweep and debouching into Lake Huron join another detachment coming through the Straits of Mackinaw from Lake Michigan. Down Lake Huron they continue, a vast and ever-growing procession, closing at Port Huron for the passage of the Straits. Then the great parade, moving steadily onward, enters the Detroit river. It is no state occasion that one beholds, but the common business of the day. Never-ending, never-stopping like shuttlecocks in some great machine they ply, making up the most impressive commercial panorama that the earth can show. Fifty million tons are passing in review, 30,000,000 of it being iron ore to be worked up by countless hands to do service to mankind in innumerable ways.

"Thirty millions of it to furnish employment to a dozen railways that lead from Lake Erie ports to the furnaces of Ohio and Pennsylvania. Day and night, month after month, all the year around, along the up-grade from Cleveland giant locomotives at front and rear, pulling, pushing, puffing, may be seen moving heavy ore trains, the locomotives yearly growing higher in the air and the cars growing longer and longer as though both were swelling with the strain of keeping up with the torrent of ore that never ceases and is ever growing. The scene is repeated at Ashtabula, Conneaut, Erie, Buffalo, Toledo, Huron, Sandusky and Lorain. It has been going on for fifty years, this toil of titan, this transfer of red, brown, blue and purple earth from the Lake Superior mines to the hungry and roaring furnaces of the Ohio and Pennsylvania valleys. When will it end? Its profusion and cheapness of transit have contributed more than anything else to the industrial success of this country. It has made its presence felt in every form and condition of existence. Truly, as Peter White said in Washington, the iron trade of the United States is a mighty solemn fact. It has lifted a people to the very apex of industrial supremacy among nations. How long will it maintain them there? Within the space of fifty years it has distributed the blessings of wealth among a greater number of individual families in the United States than any other nation can boast, though it be a thousand years old. How long is this beneficence to continue?

"'Tis a far cry from the six tons of bloom iron per day that were made in the Jackson forge in 1849 to the 18,009,252 tons of pig iron that were produced in this country in 1903. Peter White, who labored with the iron makers in the beginning, the day of small things, saw a single American company, working with Lake Superior ore exclusively, produce last year more steel than was made in the whole of Great Britain. The United States Steel Corporation produced last year 8,406,378 tons of steel, against 5,134,101 tons in Great Britain, exclusive of castings. Peter White's six barrels have grown indeed. He saw this same company ship 16,500,000 tons of ore from the Lake Superior country in a single season. What a contrast to the sleigh that held a single ton when he was a boy, to the time when 18 tons was considered a big day's haul, when a stock pile of 1,000 tons was all that could be accumulated over winter."

MEXICO INCREASES TARIFF.

The new Mexican tariff, which is to go into effect Sept. 1, shows increased duties on nearly a hundred articles. Following are some of the products affected by the new regulations, the old rates being inserted in parentheses:

Columns, steel or iron, when they have been perforated or a special cut, brackets, bed plates for columns, fish plates, braces, with or without bolts, and other pieces of iron or steel for building purposes, not otherwise specified, per gross kilo (3 cents), 4 cents.

Electric lamps, incandescent commutators, extinguishing devices, circuit closers with handles, fuses, cut-outs, rosettes and safety pieces, per gross kilo (10 cents), 11 cents.

Electric lamps, arc, per gross kilo (5 cents), 6 cents.

Girders, iron or steel, not having perforations, nor special cut, per gross kilo (2 cents), 3 cents.

Girders and columns of iron or steel that have perforations or special cut brackets, bed plates, for columns, fish plates, braces, with or without bolts, or other unspecified pieces of iron or steel for building purposes, per gross kilo (3 cents), 4 cents.

Hoops, iron and clasps, for fastening packages, per gross kilo (1 cent), 2½ cents.

Machines of all kinds for industry, agriculture, mining and the arts, not specified, and their loose parts or repair pieces, per 100 kilos ($1.50), $1.65.

Plows and loose parts, or repair pieces, sickles, scythes, and other implements for agriculture and clearings, per gross kilos ($1.50), $1.65.

Rails, iron or steel, when the weight of the linear meter does not exceed 10 kilograms, per gross kilo, 2 cents.

Rails iron or steel, when the linear meter does not exceed 10 kilograms and switches, turtles, ties, frogs, spikes and fish plates, for laying rails, per gross kilo, 2 cents.

Steel in bars, of various shapes, per 100 gross kilos (5 cents per kilo), $5.50.

Wire, iron or steel, more than one millimeter in diameter, per 100 gross kilos (5 cents per kilo), $5.50.

Wire, iron or steel, one millimeter or less in diameter, per gross kilo (8 cents), 9 cents.

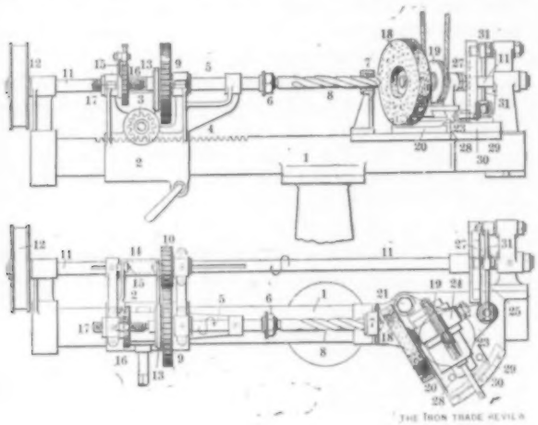
Wire, for fences, per 100 gross kilos, $2.50.

Article 3 of the decree of Feb. 23, 1897, which reduced by 50 percent the import duties on iron piping intended to be used for city water supply systems, and the provisions of all laws, circulars, and other legal enactments contrary to the terms of the present decree are repealed, except the provision of the law of March 25, 1905, which granted certain franchises for mining, and the provisions of the law of May 30, 1905, which exempted from payment of duties, such foreign articles as being included among those designated by the executive and imported into the territory of Quintana Roo for consumption therein, which provisions are to remain in force for the time fixed by the laws mentioned.

Some New Things for the Shop, Chiefly by Way of the Patent Office.

Machine for Sharpening Twist Drills.

Johannes Joachim Dahl has patented a machine for sharpening twist drills, shown in the accompanying illustrations. The invention relates to improvements in machines for sharpening twist drills, in which a rapidly-rotating grinding disc operates in conjunction with a continuous rotating drill, while the disc is successively positioned at various angles with respect to the axis of the drill. In the illustration, on the tubular bed 1 is mounted the spindle-stock 2, which may be moved by means of the pinion 3 on the rack or toothed portion 4 of the bed. The spindle 5, receives in a clamp 6, the rear end of the drill. The drill is centered at its forward end in a collar plate 7, and is driven through the medium of the gear wheels 9 and 10. By means of the eccentric 13 the sleeve



MACHINE FOR SHARPENING TWIST DRILLS.

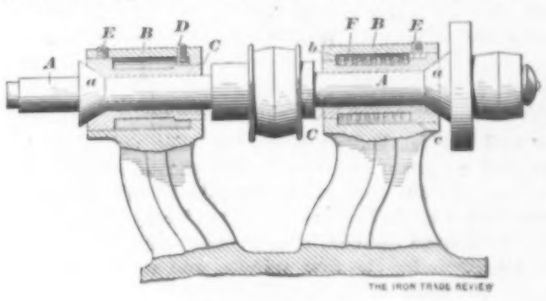
14 is set in oscillation and in conjunction with the ratchet device 15, 16, the drill 8 may while in rotation be slowly moved by the screw 17 against the grinding disc 18. This disc is driven from a rope pulley 19 and is mounted on a support, the base plate 20 of which is rotatable around the vertical pivot 21, while the plate 23, carrying the bearing of the shaft of the grinding disc, is rotatable around the pivot 24. The plate 23 is connected to a bell-crank lever 31 by means of the link 25. The bell-crank lever, pivoted to stationary suspending means, is in operative engagement with the cam-groove 26 on the cam 27, the cam being mounted on shaft 11. The movement of the plate 23 is limited by stops.

In operation the drill after being positioned in the clamp and collar is led against the grinding disc at the moment when the latter is in its first position. When the machine is set in motion, the cam-path 26, one half of which is concentric with the axis, moves the grinding disc from its first position to a number of succeeding positions, the drill meanwhile being gradually moved against it by the ratchet mechanism 14, 15. During the time the drill rotates one-half a revolution, the cam produces rotation of the upper support 23 around the pivot 24. This rotation continues until the plate 23 strikes against the stop-pin 29. When the plate 23 strikes against the pin 29, the plate 20 begins to turn around the pivot 21, the rotary movement having not previously taken place on account of the plate 23 turning more readily than plate 20. By means of this rotation around the pivot 21, the grinding disc is presented at a different angle against the drill and by this means the edge of the thread being presented is backed off or beveled.

The pin on the bell-crank lever 31 next engages the concentric part of the cam-path 26, so that movement of the bell-crank lever or the link 25 takes place during the next half rotation of the cam, while during the quarter turn of the drill corresponding thereto the end presented to the grinding disc passes over one helical groove. Shortly before entering this phase, the support is again turned round, and brought to the original position, and the movements of the support are repeated so that the second half of the drill is operated on. The grinding is not completed in one rotation of the drill, but when the point has been ground, as above described, a number of rotations are necessary, the drill being moved gradually against the grinding disc.

Shaft Bearing.

John H. Harrington has invented and patented an improvement in shaft-bearings. The bearing is shown herewith. In the illustration A is the shaft and BB are two boxes through which the shaft passes. In each of the boxes, and encircling shaft, is a sleeve C which forms the shaft-bearing. While one sleeve is fixed against longitudinal movement by a screw D, the other sleeve is free to move longitudinally. Both sleeves are restrained from rotary motion by screws E. Encircling the sleeve that is free to move longitudinally is a coil-spring F, which acts on the sleeve to press it outward. On the shaft adjacent to the outer end of each sleeve C is a large collar *a*, preferably conical in form, which engages a correspondingly formed cavity in the end of the sleeve. One sleeve being stationary and the other movable longitudinally, it will be seen that the spring F pressing its sleeve outward in contact with the adjacent shaft collar will draw the shaft so that its other collar will bear against its sleeve, the result being that at all times the shaft has at both points a firm solid bearing, so that it will run smooth and steady. The wear is automatically taken up and as a result of the smooth running of the shaft the work to be done is better



SHAFT BEARING.

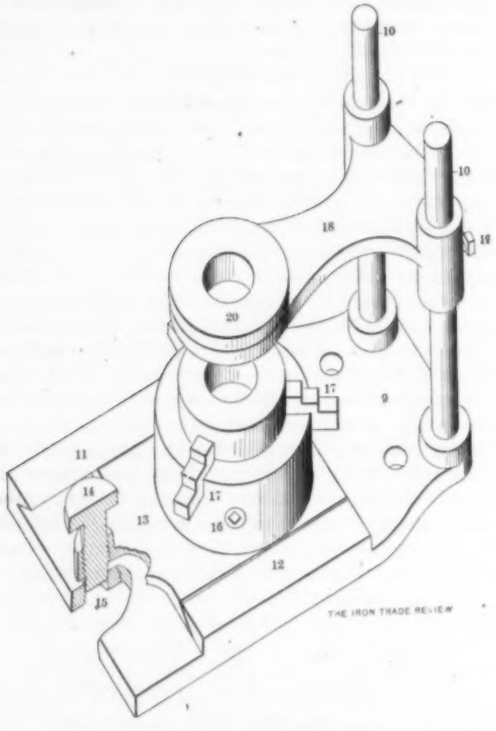
and more easily accomplished and the life of the bearing is materially prolonged.

Drilling Machine Attachment.

An attachment for drilling machines has been invented by Joseph P. Barnes. The object of the attachment is to provide a work-holder and a tool guide for drilling machines, which are engaged in working material of a cylindrical variety—for instance, washers, collars, spur-gear blanks, etc. The attachment is designed for use with multiple spindle machines, in which a portion of the work is accomplished by one tool, and another portion by a second tool, and so on. In the illustration the base plate 9 has two guideways 11 and 12 extending along its upper face. Two supports 10 have a connection with the base-plate. A slide 13 is fitted to slide in the guideways 11

and 12, and supports a screw 14, having its lower end fitted to enter an opening 15 in the base-plate. By means of this screw the slide may be held in a certain relation respecting the base plate. To the slide is secured a universal chuck 16, which supports the work. The supports 10 hold the guide 18 in a manner to permit it to be vertically adjusted and held by the screws 19. The guide has a vertical opening in which is placed a bushing 20. The base-plate is secured in connection with the table of the drill-press in such a manner that the plate with its attachments are centrally under the spindle.

In operation the blank to be operated on is clamped in the chuck, and the slide supporting the blank is placed in connection with the base-plate of the drill. The spindle is lowered to bring the first tool into the working position, and the self-feeding mechanism is started. When



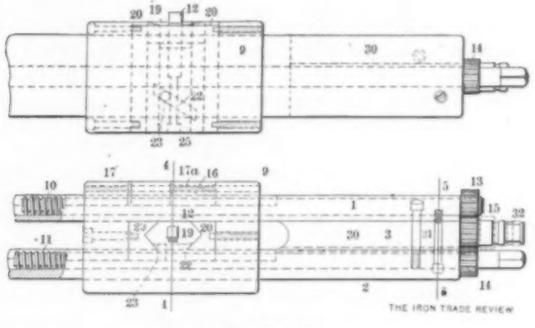
DRILLING MACHINE ATTACHMENT.

the tool has finished its work, the slide and piece being operated on are transferred to the second spindle of the machine and the tool in that spindle is allowed to complete its work. When the work has been transferred under the second spindle, a new slide and piece of work are placed under the first spindle, and so on, thus keeping all the tools of the machine busy.

Boring Bar.

A patent has been granted to John Riddell upon improvements on boring bars. A boring bar is shown in the accompanying illustration, composed of two parts, 1 and 2. The outside of the bar is cylindrical and is turned true to form a guide for the sliding head which carries the cutting tool. The pieces 1 and 2 are provided with curved outer faces and flat inner faces, which engage with a central piece. This piece is provided with a projection which enters the screw-receiving opening of the part 2 and locks the two portions of the bar together. Between the part 1 of the bar and the cylindrical piece is a key which locks the parts against sidewise movement and the three pieces are secured against radial separation by screws. The end of the bar next to the head is screw threaded and attached to a lathe chuck, which is driven by the spindle in the usual manner. The outer end of the bar is supported in a bearing which is mounted in an adjustable standard on the lathe. The spindle prevents the bar from moving longitudinally. The piece which is being worked upon is supported on the lathe by a carriage which may be made movable or stationary. A sliding head is provided having a cylindrical opening, which makes a working fit with the bar and is guided thereby. Extending longitudinally of the bar and located in grooves formed therein are two feed screws 10 and 11, the former being arranged to move the carriage, while the latter moves the cutting tool 12 and also aids in moving the head. The grooves for receiving the screws are both located on the same side of the parts 1 and 2, thereby permitting the screws to be brought close together and thus reduce the total diameter of the bar to a minimum. The right-hand ends of the feed screw are provided with gears 13 and 14, having the same number of teeth, and between these gears is an idler-gear 15. The idler is mounted on a stub-shaft 32 and is provided with an elongated hub, by means of which the gear can be slid endwise on its shaft when it is desired to move it out of mesh with the gears 13 and 14 for the purpose of feeding the tool without moving the head.

The outside of the head is slotted to receive a half nut, which is retained in place by a screw that extends through the head parallel with the feed screw. This nut is employed in moving the head longitudinally on the bar when it is desired to set the tool in position. The nut is so made that compensation for wear of the threads can be made. The center of the head 9 is provided with a rectangular slot which coincides with the space between the two main parts of the bar, and mounted in this space



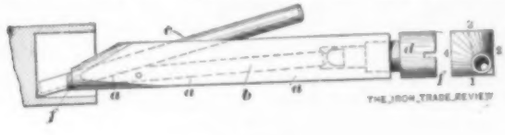
BORING BAR.

is a sliding tool support 19. The ends of the tool support are V-shaped, and engaged therewith are gibs 20, each of the latter being held in place by two screws arranged at opposite ends. The front face of the sliding tool support is provided with a diagonally-extending cam-groove 22 and mounted for engagement therewith is a pin 23, which is carried by a half-nut. As this nut is fed forward or back the pin 23, working in the cam-slot, will move the tool support or carrier radially toward or away from the center of revolution of the bar. The cutting tool 12 may be of any suitable shape and is provided with a rectangular shank, which enters a corresponding socket in the tool-support.

When it is desired to feed the head forward or back, a handle is applied to the squared end of the shaft and the latter rotated. The corresponding motion is then imparted to the second feed screw through the idler gear 15 and the gear 13. In order to feed the tool independent of the head, the idler gear 15 is moved out of engagement with the other gears. Motion is then imparted to the feed screw 11, and the pin 23 will move the tool in or out, as the case may be. The rotation of the bar is relatively slow, but feeding can be accomplished under certain conditions while the bar is in motion.

Tool-Holder.

A tool holder for lathe tools has been patented by Hellmuth Langer and George Bock. An essential feature of the holder is a special construction of a locking device, another feature of the invention being the arrangement of the cutting tool. The tool holder consists of a body portion *a*, which is rectangular in cross-section. At the forward end the body portion is made substantially conical or tapered from the sides 3 and 4 toward the corner formed by the junction of the sides 1 and 2. The body is provided with a tool-receiving hole *a'*, which is arranged at a downward or acute angle with relation to the edge *ff*. This opening for the tool *c* passes out through the apex of the conical formation or at the corner 1 2. The body is provided with a longitudinal bore *a''*, in which is arranged a locking rod *b*. This bore is arranged at an angle with relation to the body and communicates with the hole *a'*. The rod *b* is tapered at its end engaging with the



TOOL HOLDER.

tool *c*, and it is prevented from rotary movement by means of a pin extended from the body into a channel formed in the rod. At the rear end, the rod *b* has rotary connection with a screw-block *d* by means of which the socket is moved inward or outward. In operation the tool is inserted in the holder and locked in place by means of the rod *b*.

IRON AND STEEL FOR THE MANHATTAN BRIDGE, NEW YORK CITY.

Specifications for the metal work of the new bridge which is to span the East river between New York and Brooklyn, a few blocks north of the Brooklyn Bridge, were given out last week by the Commissioner of Bridges of New York city. Bids will be opened on August 10. The bridge will be of the cable suspension type, and will have a length over all of 9,330 ft. It will require some 43,000 tons of steel besides cast iron, bronze and other metals. The completed structure is to cost between 15 and 16 millions of dollars.

The specifications fill 33 pages. The following are a few extracts:

Rolled Carbon Steel.

All structural steel, excepting that to be used in the architectural work, ladders, gratings and such similar minor details as the engineer may specifically exempt from the exclusive use of such steel, shall be made in an open hearth furnace lined with silica.

The stock from which this steel is made shall consist of pig iron, or of washed pig, or of a combination of both. Acid open-hearth scrap resulting from previous heats for this work may be used in quantities not exceeding 25 percent.

Washed pig shall not be decarbonized below 1.50 percent during washing, and an analysis for carbon, phosphorus and sulphur shall be made from each cast. During the reduction of steel in the open-hearth furnace decarbonization below 0.12 percent of carbon will not be allowed.

No stock used in the open-hearth or the washing furnace shall contain more than 0.10 of one percent of phosphorus or more than 0.04 of one percent of sulphur.

Rolled Nickel Steel.

All nickel steel shall be made in an open-hearth furnace lined with silica. It shall be made in the same manner and of the same stock as specified for rolled carbon steel with the addition of nickel.

The ladle test shall contain not less than 3.25 percent of pure nickel, and not more than the following proportions of the elements named: Phosphorus, 0.04 percent; sulphur, 0.04 percent; manganese, 0.60 percent; silicon, 0.10 percent.

Nickel rivet steel shall contain not less than 3.25 percent of nickel and not more than 0.035 of one percent of phosphorus, nor more than 0.03 of one percent of sulphur.

Nickel steel for plates and shapes in the finished material must meet the following physical requirements: Ultimate strength, 85,000 to 95,000 lb. per sq. in.; elastic limit, 55,000 lb. per sq. in. minimum; elongation in 8 in. (percent), $\frac{1,600,000}{\text{ultimate}}$ minimum; reduction of area, 40 percent minimum.

Nickel rivet steel shall have an ultimate strength of 70,000 to 80,000 lb. per sq. in., an elastic limit of at least 45,000 lb. per sq. in., and a percentage of elongation at least equal to $\frac{1,600,000}{\text{ultimate}}$ in 8 in.

Steel Castings.

Steel for castings shall be made in an open-hearth furnace lined with silica. At least one-third of all stock shall be pig iron. During the reduction of the steel in the furnace, it shall not be decarbonized below 0.10 of one percent. The ladle test of steel for castings shall not contain more than the following proportions of the elements named: Phosphorus, 0.05 percent; sulphur, 0.05 percent; manganese, 0.80 percent; silicon, 0.35 percent.

Test pieces taken from coupons on the annealed castings shall show an ultimate strength of not less than 65,000 lb. per sq. in., an elastic limit of at least 35,000 lb. per sq. in., and an elongation of not less than 20 percent in two inches. They shall bend without cracking 120 degrees around a rod three times the thickness of the test piece.

Material for Cables, Suspenders and Hand Ropes.

All steel for wire for the cables, suspenders and hand ropes shall be made in an open-hearth furnace, lined with silica. The wire for serving the cables shall be made of Norway iron of a quality approved by the engineer.

The ladle tests of the steel shall conform to the following chemical requirements: Carbon, not to exceed 0.85 percent; manganese, not to exceed, 0.55 percent; silicon, not to exceed, 0.20 percent; phosphorus, not to exceed 0.04 percent; sulphur, not to exceed 0.04 percent; copper, not to exceed 0.02 percent.

The wire for cables, hand ropes and suspenders shall have an ultimate strength of not less than 215,000 lb. per sq. in. before galvanizing, and an elongation of not less than 2 percent in 12 in. of observed length, the stretch to be measured while the specimen is in the testing machine. The bright wire shall be capable of coiling cold around a rod 1½ times its own diameter without sign of fracture. The cable wire before galvanizing shall measure 192-1000 of an inch in diameter, and shall not vary in gauge more than 3-1000 of an inch. It shall be drawn on large-sized blocks, and finished in single lengths of not less than 3,000 ft. and shall be drawn as straight as possible without any kinks or sharp bends. The serving wire shall be No. 9 gauge before galvanizing. After galvanizing the steel wire shall have an ultimate strength of not less than 200,000 lb. per sq. in. of gross section.

Cast Iron.

All iron castings shall be of the best quality of gray iron, free from injurious blow holes or other defects, true to pattern and thickness with smooth surfaces and of workmanlike finish. Sample pieces, one inch square, cast from the same heat of metal in sand molds, shall be capable of sustaining on a clear span of one foot a central load of 2,000 lb. Three test bars shall be furnished by the contractor from each heat. If two of these fail to meet the above test, the castings from the heat will be rejected. A blow of a hammer on a rectangular edge of a casting shall produce an indentation without flaking the casting.

MICROSTRUCTURE AND FRICTIONAL CHARACTERISTICS OF BEARING METALS.*

BY MELVIN PRICE.

The investigation here recorded was carried out in the laboratories of the department of Mechanical Engineering and the department of Metallurgy at Columbia University. The main questions considered were: (1) The law of variation of the amount of friction with the velocity of sliding, other conditions remaining constant. (2) The theory of Charpy and others regarding the function of the hard grains and of the plastic ground mass in the microstructure of alloys. (3) The theory of Professor Goodman, which received the credence of Prof. W. C. Roberts-Austen, the eminent metallurgist, which theory related to the effect produced by elements of high atomic volume as distinguished from the effect of those of low atomic volume in bearing alloys.

Regarding the first of these questions, in the earlier years of the last century, Morin made many observations which he interpreted to mean that the force of friction is independent of velocity.

The theory of Charpy evolved through an investigation of the metallurgy of a number of alloys belonging to the types commonly noticed in use in machine practice for bearings was that the friction of hard substances was less than that of soft ones, and that, therefore, the hard grains in alloys supported the load and contributed to the alloy whatever anti-friction quality it possessed, while the plastic ground mass in which the hard crystals were embedded served to allow the bearing step to mould itself around the shaft, producing a better fit.

Goodman's announcement was to the effect that whenever a bearing alloy supposed nominally to contain the ordinary *pure* metals commonly used for such purposes had added to it a third constituent, the friction was raised or lowered in value according as the added constituent was of low or high atomic volume.

Laws of friction.—The laws of friction as announced by Morin were as follows:

(1) The friction between two bodies is directly proportioned to the pressure, i. e., the coefficient is constant for all pressures.

(2) The coefficient and amount of friction, pressure being the same, is independent of the areas in contact.

(3) The coefficient of friction is independent of velocity, although static friction (friction of rest) is greater than friction of motion.

In direct contrast with the above, we find the modern beliefs regarding frictional behavior stated by Mr. John Goodman in a review of the results obtained from the testing machines of Thurston, Tower, and Stroudley, as follows:

(1) The coefficient of friction for moderate pressures and speeds varies approximately inversely, as the normal pressure.

(2) The frictional resistance varies as the area in contact, the normal pressure remaining constant.

(3) At very low journal speeds the coefficient of friction is abnormally high; but as the speed of sliding increases from about 10 to 100 ft. per minute the friction diminishes, and again rises when that speed is exceeded, varying approximately as the square root of the speed.

The apparatus by means of which Morin's laws were obtained consisted essentially of a traineau, or sled, whose performance upon a rectilinear track was studied.

Latterly we have seen for the friction test various contrivances, nearly all of which differ radically from the ingenious mode of Morin. Rotative devices are now the most commonly used. In these the moment of the friction is usually measured directly. By means of a rather good machine of the latter type Mr. Beauchamp Tower has given to us the results which perhaps form the best basis for a law of friction of which we now have knowledge.

It has been shown that, contrary to the announcement made by M. Morin, the resistance may not always be independent of velocity. We shall now turn to an investigation carried forward for the purpose of finding out whether or not there is a definite law of dependence, such as the one quoted above, or whether the variation appears as characteristic of the given material.

A number of alloys were made and ingots cast into bars of suitable shape, from which sections were cut, polished and examined with the microscope. Suitable half-bearings were then prepared for the testing machine, and from these the frictional retardation curves were obtained. The following method was used for observing the manner in which the friction varied with the speed:

It occurred to the writer to attempt to measure the force of friction by means of the retardation it produced in the speed of a rotating shaft loaded by having mounted concentrically upon it a heavy disc, when the rotation was subjected to no appreciable retarding or other force except the friction of the two journals, at the shaft ends, in simple half (or less) bearing steps. For observing the fall in speed an instrument due to Mr. F. H. Ball Jr., which may be called the vibrating tachometer, was employed. The latter consists essentially of a long stiff steel bar, fixed at one end, horizontally, and made to tremble by means of an instantaneous contact electromagnetic arrangement similar to that employed in electric bells. At the free end is attached to the bar, in a vertical plane, a screen containing a narrow horizontal slot. When stationary, this slot just opposes an exactly similar one cut in a stationary screen fixed in the vertical plane, parallel and very near to the screen carried by the vibrating bar. When the movable screen is set vibrating at a sufficiently high frequency any recurring or cyclic motion observed through the stationary screen will exhibit at successive distinct instants of time the particular phases of its action which are occurring when the vibrating and stationary screens are opposed.

Two bearing steps were fastened to the sides of a steel frame supported at a convenient height. The rotating shaft was ¾ in. in diameter at the middle and was cut down to ¼ in. in diameter at each end where the steps were fitted. In order to reduce to a minimum the liability of having large apparent areas of contact, but small real ones, these bearing steps were cut to a longitudinal width of about 0.04 in., while their circumferential arc embraced considerably less than half of the ¼-in. journal. The journal was slightly scored to permit only a small amount of axial motion. At the center of the shaft was mounted a solid brass disc ⅝ in. thick and 5 inches in outside diameter. The weight of the disc and shaft was 4.14 pounds. At a short distance away on each side of the disc a journal ½ in. in diameter was cut, which ran in bearings at the ends of two arms which were pivoted at a short distance away to the frame of the machine. Attached to these a handle was provided, by means of which the arms could be raised, hooking their ends under the shaft in the journals provided, thus enabling the observer to raise the rotating system clear of the test bearings into contact with a moving belt, and when at speed to set it down again upon the test bearings and, unhooking the arms, to allow the system to spin freely, except for the friction, when its performance could be

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observed by the tachometer, suitably arranged a few feet away. The source of power was a small electric motor, provided with a switch for stopping it quickly at will; a round belt from the motor's pulley traveled over a guide pulley at each end of the frame above mentioned. This belt ran in a horizontal direction an inch or so above the shaft, so that when motion was to be imparted to the rotating mass, it was only necessary to hook the arms under it and raise it clear of the test bearings until a circumferential groove in the shaft engaged with the belt, setting the system into rotation.

Alternate quadrants of the brass disc were blackened and the remaining two whitened. Then obviously what may be called a velocity "node" would occur when its speed was such that it made one-half a revolution in the same time in which the screen made one-half oscillation; also when it made a whole revolution per half-oscillation; and also when it went one and one-half revolutions, etc., or nodes would occur at shaft speeds of 1, 2, 3, 4—n times the frequency of oscillation. It was also possible with a little practice to observe the nodes at greater speeds, these being distinguishable from a certain appearance of uniformly gray color on the disc, apparently stationary, as in the case of the half-nodes. These occurred when the disc revolved one-fourth a circumference in the same time that the screen made a half-oscillation.

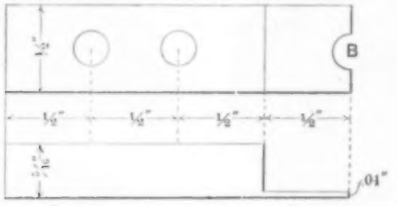


FIG. 1.—FORM OF BEARING FOR FRICTION TEST.

At first it appeared that since great uncertainty must exist as to the amount of area really in metallic contact in large bearings, it would be well to eliminate as much of this uncertainty as possible by reducing the bearing area. Be it well or ill, it has been assumed that with smaller areas to attend to, very probably the apparent area would represent more nearly the true area in contact. Hence it was decided to work with small areas. In the method adopted the observing apparatus was entirely detached from the system being observed, as was every other disturbing influence except the atmospheric friction, and whatever vibrations were set up by the spinning system itself.

Another part of the work lay in the field of metallurgy. In that connection a number of alloys were made, in which the major number of the different structures which had been noticed might be expected to exist. A number of these were not unlike empirical bearing metals of commerce. These were utilized in the present investigation in the following manner: To a bearing alloy, which usually was very rich in some one of the softer metals, as lead, tin, aluminum, copper, etc., a third constituent would be added in three different proportions. The plan was first to add to the bearing alloy a mere trace of a third metal, which might be supposed to change merely the grouping of the atoms of the other two metals without developing any new crystalline arrangement. Next a somewhat larger quantity of the third constituent was added, which might either develop a new network arrangement of the two excess metals, or develop small crystals of a chemical compound with one of these metals. Then a still larger amount of the third constituent was added, which was thought would bring out a larger number of crystals of chemically combined metals, or in some other way change the microstructure. It was hoped in this way to obtain examples of changes effected by the presence of third constituents in bearing alloys which might in some measure correspond to changes in the higher orders of asperity upon polished sections.

Specimens of these alloys were cast in an iron mould in the shape of a bar ½ inch x $\frac{5}{16}$ inch x 4 inches, which was planed to a triangular cross-section, and two sides of the prism thus formed were polished and examined under the microscope, before etching, in order to make out so far as possible the harder portions, which then showed in relief. Then the face was etched and further examined.

For the friction test, from a bar like the one whose dimensions were given above, there were shaped two thin sliced bearings, of about the dimensions of the accompanying sketch, which were bolted to the sides of the frame of the testing apparatus above described, where the bearing surface, B, supported the journals at the ends of the spinning shaft, and was the test surface. The journal was run in these bearings until it could be seen just which were the contact areas, and these were then taken down slightly with emery cloth and the journals again run upon the bearings, and the process repeated until, so far as could be observed, a perfect fit was attained. Then the retardation curves were taken in the manner indicated above.

At first it was believed that the true frictional characteristics of the solid materials would be best exhibited in the absence of unguents. But after numerous trials under such conditions, and also under conditions of scanty lubrication, it was decided that at least for the pressures and speeds commonly employed, the amount of abrasion always present made it seem clear that whatever results might be thus obtained would be some kind of an index of rupture, or inner friction, instead of resistance to sliding or outer friction. Accordingly, in the experiments here recorded the bearings were supplied with as much oil (mineral) as would adhere to the journals and to the test bearings after each one or two performances. Such efforts at giving the rubbing members as great an amount of the constant unguent as they would "hold" constitute the whole of the efforts made at uniformity of conditions regarding lubrication.

Difficulty at once appeared when it was desired to interpret the large mass of data obtained. Uniformity of results at first appeared among the impossibles. The friction of the bearings was variable; worse, it was capricious in its behavior. However, as performances were repeated, great care being taken, with cleanliness and uniformity of lubrication, it was noticed that for a given metal the latterly obtained curves tended toward uniformity of shape, although absolute values of resistance always differed, sometimes only slightly, sometimes considerably. In view of this it was decided that certain performances should be elected from the masses, for each metal which should reflect most nearly the frictional qualities of that metal. In electing these performances at least two qualifications were recognized as essential: (1) Recognizing the fact that probably abrasion caused the majority of the caprices above noticed, and that probably always abrasion increased the resistance; and feeling also a desire to find some basis of comparison of metals as to their absolute resistance, it was decided to elect performances from among the best for each metal, or those showing the lowest resistances. (2) Whenever there appeared a decided but uniform tendency toward some peculiarity in the variation of the resistance, it was

decided to select those performances which emphasized these peculiarities most.

The accompanying curves were plotted from the results obtained.

Curves Showing the Variation of Frictional Resistance with the Speed.

Noticing first the curves of the pure metals, it is at once apparent that aluminum, copper and lead have similar speed friction variations in general, but their curves are quite different in detail. Generally, in all three, the resistance is high at high speeds, becoming less as the speed lowers, but rising again near the vanishing point of speed.

The resulting curves for these three metals are not at all similar. A scale factor applied to any one which

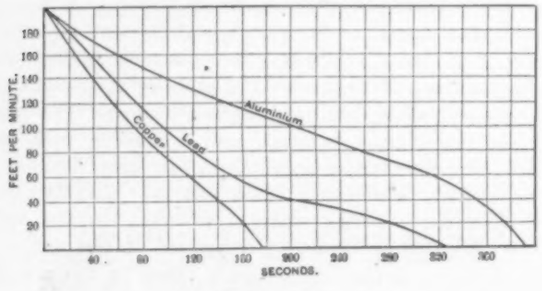


FIG. 2.—CURVES OF PURE METAL.

would make the total running times equal would show the other co-ordinates vastly unequal. This has the effect of impressing us with the fact that the metals have frictional individualities.

Microstructures.

In the writer's laboratory at the University of Nebraska, about one year after the above resistance data were taken, the alloys were examined with the microscope. The original ingots, which had been shaped into bearings for the resistance tests, were sectioned, polished with rouge and water upon a wheel faced with baize, etched by a light acid attack, and magnified for examination.

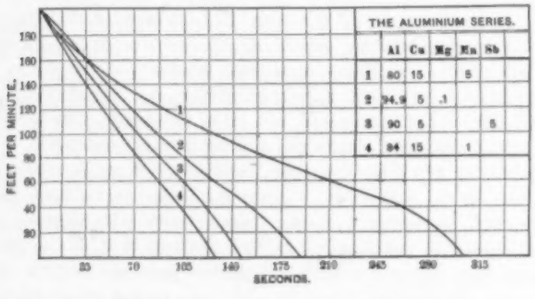


FIG. 3.—CURVES OF ALLOYS OF THE ALUMINUM SERIES.

If we are to look for confirmations in the microstructures of any beliefs suggested by frictional performances, we must, of course, neglect the effect of the year's time which elapsed between the tests and the examinations which will now be recorded.

Considerable uncertainty exists regarding the chemical combinations of metals. It is widely believed that SbSn exists. Also Cu_3Sn and **Sb** Cu_2. Indications in the work of Alder Wright have pointed to Bi_3Sb_2 and $CuZn_4$. In the absence of more reliable data, it will be assumed that some such compounds exist, but the atomic proportions will be omitted.

It must also be remembered that we are here dealing with ternary alloys. Very great uncertainty exists as to just what happens in a given case when three metals are melted together and, after being mechanically mixed, allowed to freeze.

In ideas of friction, hardness of the rubbing members comes largely into evidence. And in alloys, where it is expected that totally different physical substances will occur side by side, it is the differences of hardness that we look for largely. The author has by two methods only been able to draw inferences about differences of hardness: (1) By the use of the sclerometer. (2) By observation under the microscope during the operations of polishing the surfaces before etching. The first kind of observation was found useful in the case of the "embedded hard grain" alloys, for it was found easy to detect deviations in the path of the diamond point where it had

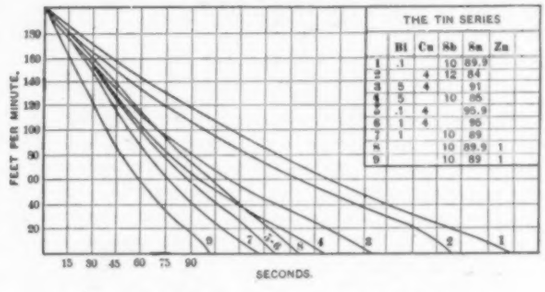


FIG. 4.—CURVES OF ALLOYS OF THE TIN SERIES.

passed around, or run over without deeply scratching, the hard grains. The second kind of observation was resorted to in a few such cases and generally confirmed the sclerometer tests.

When no means was at hand of knowing what differences of hardness existed, it was assumed that portions of the surface which behaved differently when treated with acid were of different constitution and therefore probably differed in hardness. Fig. 6 shows the photomicrograph of an aluminum-copper alloy, in which magnesium is the third constituent. Relief polishing gave no evidence of differences of hardness, and neither did the sclerometer. But when etched, large black islands

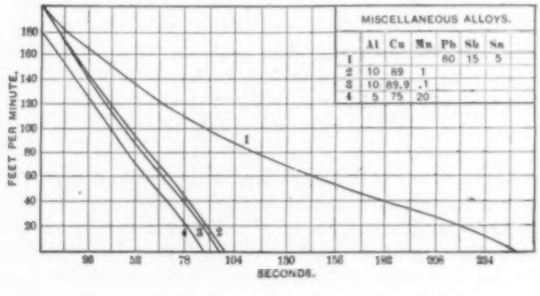


FIG. 5.—CURVES OF MISCELLANEOUS ALLOYS.

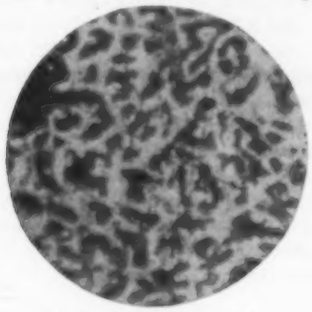
formed on the surface, which constitute almost exactly one-half of the area. Neglecting the magnesium, it is evident that if this black portion is the chemical compound of aluminum and copper, it must be one in which the number of atoms of aluminum is very great, compared with the number of copper atoms; in fact, the disparity is too great to admit of the possibility of its being composed entirely of such a compound. The same may be said of the white area. If the alloy is a solid solution of copper in aluminum, it is a very heterogeneous one, and marked segregation has taken place where we should expect the opposite under the conditions of casting (the ingot was cast in a chill mould). It is at once seen that if either of the eutectics Al (67) Cu (33) or Al

(46) Cu (54) had formed the area taken by it would not be nearly so large as one-half of the total area.

The Aluminum Series.

In Fig. 7 are shown the white alloys of copper and aluminum, resistance curves of which have been given above. These were etched with HNO_3 instead of HCl. To illustrate more clearly the difference of appearances when differently etched, Fig. 8 shows (b) of Fig. 9 etched with HCl. The thin medial lines in the white network of Fig. 8 are not unlike the black lines of (b) Fig. 9, and we may reasonably conclude that they are the same.

HCl $\frac{1}{1}$



Al (94) Cu (5) Mg (1)

FIG. 6. ALUMINUM-COPPER ALLOY.

HNO_3 $\frac{1}{1}$ HNO_3 $\frac{1}{1}$ HNO_3 $\frac{1}{1}$ HNO_3 $\frac{1}{1}$

Al (80) Cu (15) Mn (5) (a)

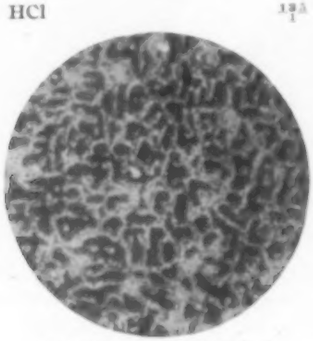
Al (94.9) Cu (15) Mn (.1) (b)

Al (90) Cu (5) Sb (5) (c)

Al (84) Cu (15) Mn (1) (d)

FIG. 7. ALLOYS OF COPPER AND ALUMINUM.

HCl $\frac{1}{1}$



Al (94.9) Cu (15) Mn (.1)

FIG. 8. ALLOY OF COPPER AND ALUMINUM.

The Tin Series.

In Fig. 9 are photomicrographs of the six alloys of the Tin Series which contained bismuth. All of these are shown by the sclerometer to have hard white crystals, embedded in soft matrices. These crystals are of three types. (1) Nos. a, d and g have square white patches, and since these alloys have goodly proportions of antimony it may be concluded that these are cubes of the compound SbSn. They seem much harder than the matrix which latter we must believe to be largely the pure tin. (2) Nos. (c) and (e) are seen to have long, white, slender patches, as well as small dots and chains of dots. (3) No. f has the same kind of small dots, but no chains or needles. The white crystals in c, e and f are harder than the matrix, so far as the writer is able to discover. These are probably CuSn.

In Fig. 10, are shown photomicrographs of the remaining three alloys of the tin series. All contain white squares, which we interpret to mean hard cubes of SbSn. No. (b) is Babbitt metal. It has white needles (presumably CuSn) in addition to the cubes of SbSn. Nos. h and i, which contain zinc as the third constituent, seem to have no hard granules except those we have called SbSn. It is seen that with Nos. b, h and i we might attribute the similarity of curves h and i, and their dissimilarity to (b), to the difference in microstructures, viz., the absence of needles and dots among the white cubes in h and i. But notice that i is magnified nearly doubly as high as h, and that even then its cubes are not nearly so large. Actually, then, the cubes of i are but dots compared with those of h. The size of the granules seems to have no reflection in the shape of the curve. Hence we can scarcely attribute the dissimilarity of b to h and i to the small dots of the former.

The great question is, to what shall we attribute similarities of curves, so that our conclusions may be confirmed by microstructure. Looking at the nine curves, and the nine structures of the tin series, as a whole, all have hard grains embedded in soft matrices. But the curves present many differences in shape. (1) So that hard grains so found are not themselves sole causes of any peculiar resistance variation. (2) Also, the size of the grains seems not to determine this resistance variation. (3) Nor does the shape of the grains themselves seem to have the determining effect on the shape of the resistance curve. But let us now notice those constituents which we have not mentioned in discussing the structures, because there seemed no good reason for their appearance as crystals, such as have been mentioned as the features of the microstructures. These may be called the "silent constituents," and are exemplified in the bismuth of a, c, d, e, f and g, and the zinc of h and i, which do not "show up" in the structures. Upon failure to assign reasons, obtainable from structure, for peculiarities of curves, may we attribute the latter to the unseen effect of the "silent constituents"? The remarkable similarity of all curves of alloys containing bismuth and of those containing zinc lend considerable weight to this otherwise purely circumstantial evidence. We may say at this time that we have here part proof, and as yet no reputation, of some such law as the following: The effect of constituents which form hard crystals is constant; the

effect of "silent constituents" varies with the speed.

Looking at the photomicrograph of the alloys whose curves have been entitled "Miscellaneous Alloys," we have the structural features of "white metal" and of three yellow alloys of aluminum and copper. See Fig. 11. In the white metal we detect small squares, and seeing that the composition admits that possibility we may say these are cubes of SbSn. These crystals are comparatively few in number, so that the structure would indicate a resistance performance not very different from that of pure lead. This is seen to be the case when curve 1 of "Miscellaneous" sheet is compared with the curve of lead on the sheet of pure metals. Here is more verification of the belief that crystals of chemically combined metals embedded in a softer matrix do not affect the manner in which the resistance varies with the speed. A question of great industrial importance is whether or not these crystals greatly affect the actual value of the resistance in the constant manner intimated above in the discussion of the tin series. Comparing the curves of "white metal" and pure Pb, by the scale of times, such belief is confirmed, for the total running time of "white metal" was 252 seconds, while the performance of pure lead was 332 seconds in duration. The effect of the crystals seems to be just what might be expected, i. e., that of increasing the resistance as a whole.

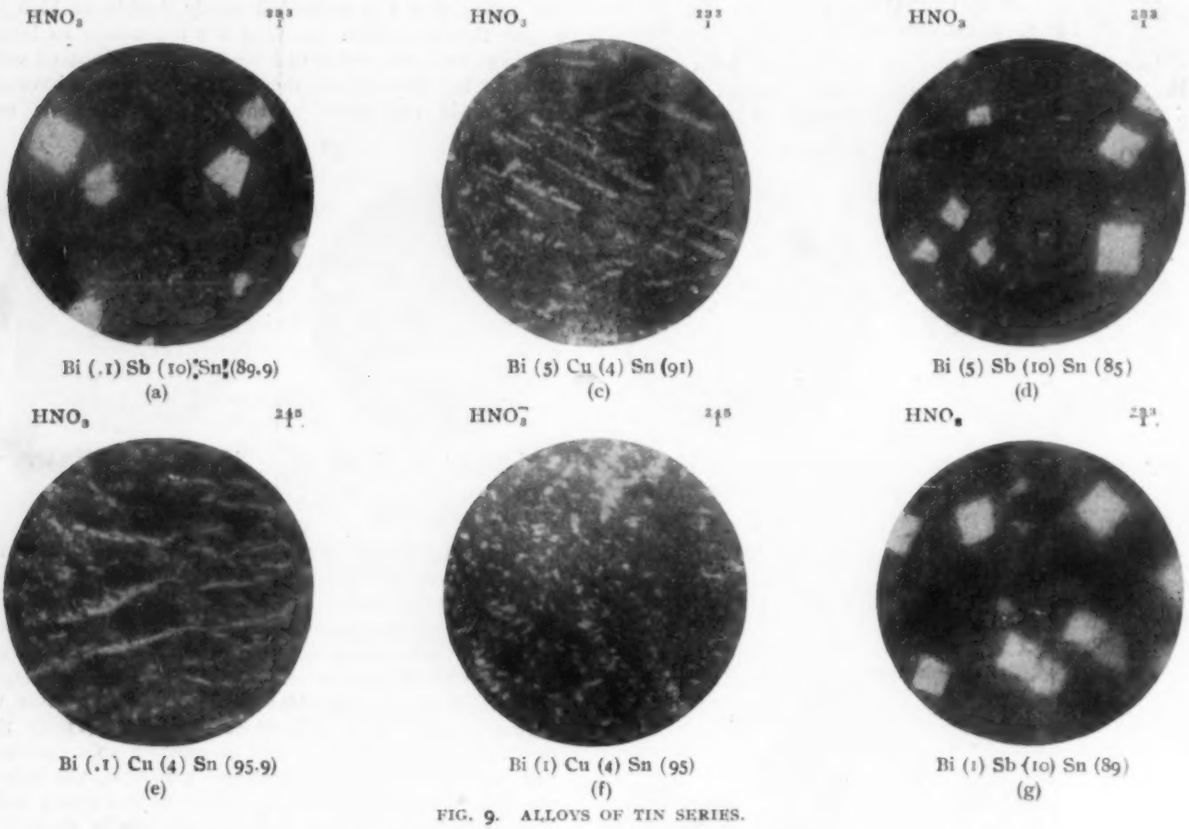


FIG. 9. ALLOYS OF TIN SERIES.

Conclusion.

We may now apply the knowledge gained from the study of the resistance curves and the microstructures to the three questions named in the first part of this paper.

(1) A glance at the results shows that a "law" could be made to apply to all of these cases at once only in an extremely general way, if at all. In short, an alloy's resistance performance seems to be peculiar to itself, although there are often partial similarities.

Henceforth our thought may take two or more different channels. It is admitted that generally abrasion is greatest at higher speeds, as we should expect. The upper portions of the curves would generally support an abrasion theory of the variation. There is also support for this in the fact that the softer metals show greater changes of resistance in falling down from the higher speeds. But the latter statement is controverted very largely by comparisons in this detail. Take the pure metals, aluminum, lead and copper; aluminum, which is second in hardness, has very little variation, while copper, first in hardness, has nearly as much of this peculiarity as the very soft lead. As a last argument in support of the influence of abrasion, we may cite the curves of the aluminum-bronzes. These were the hardest of the alloys, and show the least—practically nothing—of variation. So that, for these instances, where there was least abrasion, there was least of higher-speed variation of resistance.

At the lower ends of the curves there are two distinct peculiarities. Fourteen of the twenty curves are decidedly convex upward, and the remaining six just as decidedly straight or convex downward. Abrasion can hardly explain the difference. And the straightness of the other six lends absolutely no support to an abrasion explanation. Also, against such an explanation there may be cited numerous small differences, noticed at high speed, between alloys physically very much alike.

On the other hand, it appeared that mechanical imperfections, microscopic structural features, hard crystals of chemical compounds and other "foreign" effects, which make up the lower orders of asperity, had a rather constant influence on the resistance. Also, that groups of alloys could be formed in which peculiarity of performance went hand in hand with one of the three constituents. This constituent was not noticed in the microstructure and was called the "silent constituent." Ac-

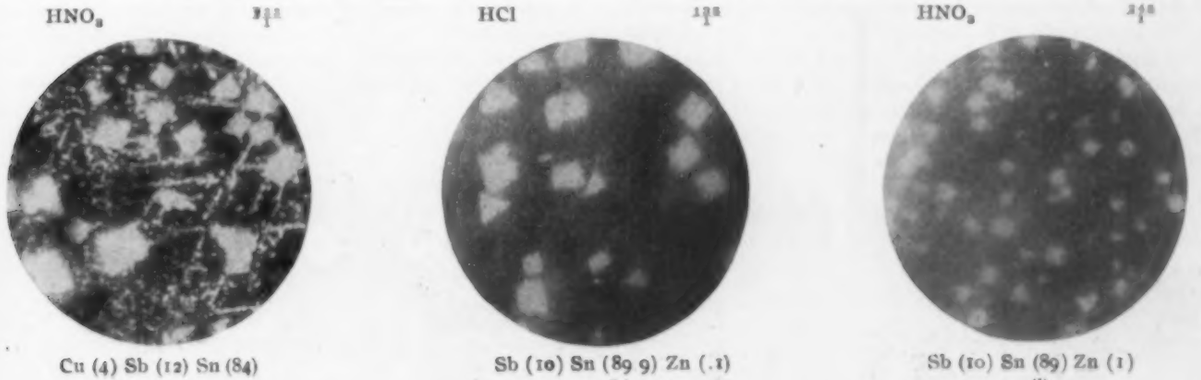
cordingly it may be inferred that such constituents affect the grouping of the atoms, or even the minute crystals, in such a way as to determine the feature of the higher orders of asperity.

On the whole, it does not seem at all improbable to the writer that the lower orders of asperity exert a nearly or quite constant resistance, or that the higher orders exert resistances varying according to the microstructure, although it may also be true that the variations noticed are resultants of two or more effects, either of which might be constant if taken separately, but that under varying conditions of speed at points more and at other points less of each effect enters into the resultant.

(2) Charpy's conclusion seems to be that it is the hard grains that contribute to the alloy whatever anti-friction quality it possesses. The results of the present investigation seem to the author to work against that conclusion. Notably so in the case of pure lead and the "white metal," which is largely lead, but has the hard cubes of SbSn. It may be well to note the performance of the pure metals, aluminum, copper and lead, in comparison with alloys of those metals. Aluminum ran longer than any of its alloys; and so did lead; likewise copper performed with much less resistance than did any of the yellow alloys of aluminum with copper. The only conclusion which can be come to is that the foreign substances introduced into an alloy as a result of the formation of isolated hard crystals tend to increase the resistance, and as noted in (1) above, in a somewhat constant manner.

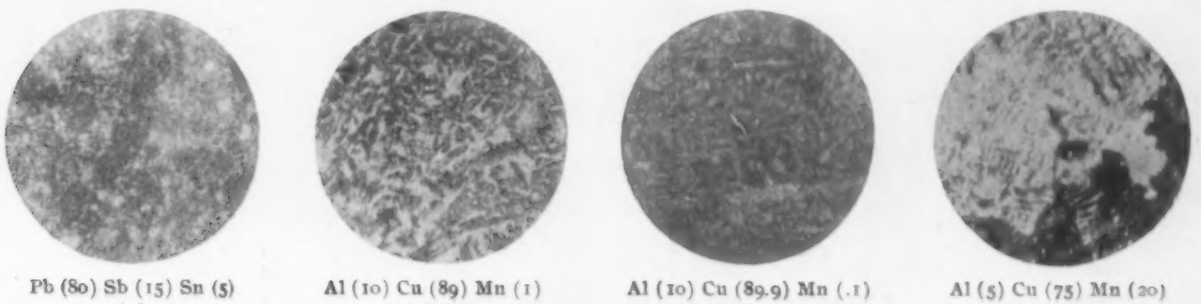
(3) The conclusion of Prof. Goodman was that if the third constituent of an alloy were a metal of high atomic volume, the resistance was diminished, and if of low atomic volume, it was increased. The observation of the writer that these third constituents when "silent" seem to have a great influence upon the variation of resistance with the speed, leaves the way clear for such a conclusion as Goodman's to obtain: since we may assume that the atomic volume of the elements affects the higher orders of asperity.

In the actual results, look at the curves of the tin series. Comparing 1 and 2, it is seen that in 2 the bismuth of 1 has been replaced by copper. The result is slightly in favor of Goodman's theory, for the atomic volume of Bi is 21.1 and (1) ran 285 seconds, while that of Cu is 7.2 and 2 ran 248 seconds. But the reverse result is obtained when in 6 we replace copper by antimony (atomic volume, 17.9), obtaining 7, which showed greater average resistance. So that these results do not support Goodman's. But it is realized that what is now offered can only be regarded as meager in its power to refute or confirm.



Cu (4) Sb (12) Sn (84) (b) | Sb (10) Sn (89 9) Zn (.1) (h) | Sb (10) Sn (89) Zn (1) (i)

FIG. 10. ALLOYS OF TIN SERIES.



Pb (80) Sb (15) Sn (5) (a) | Al (10) Cu (89) Mn (1) (b) | Al (10) Cu (89.9) Mn (.1) (c) | Al (5) Cu (75) Mn (20) (d)

FIG. 11. MISCELLANEOUS ALLOYS.

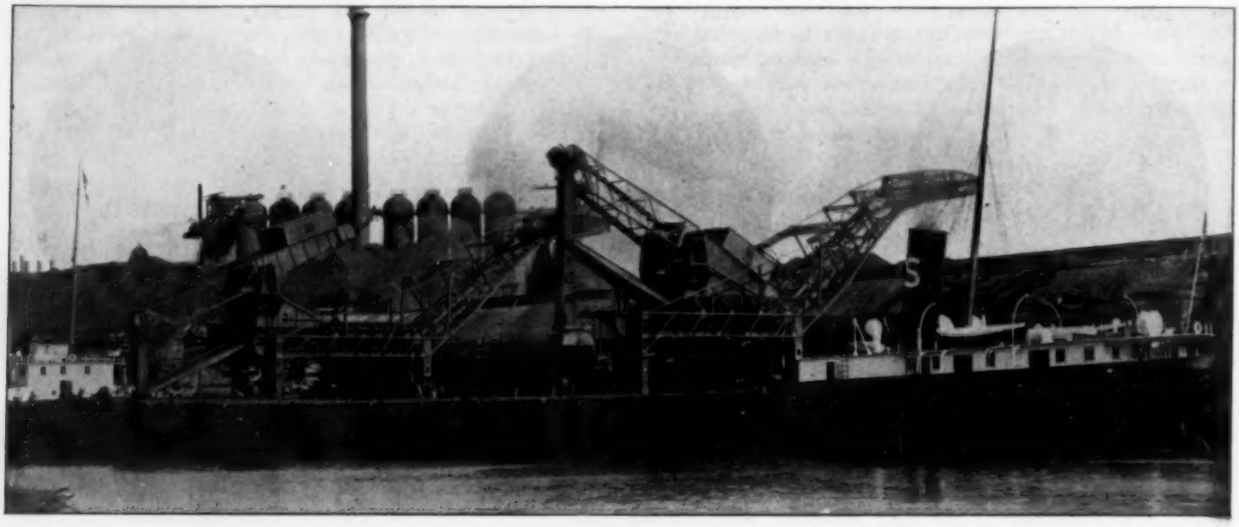
MOST ENCOURAGING.

Is Outlook for Fall Business, Says Chas. H. Zehnder, of Philadelphia.

President Charles H. Zehnder, of the Allegheny Ore & Iron Co., who is the Philadelphia representative of Rogers, Brown & Co., and has other large interests which keep him in close touch with the business situation, is very optimistic as to the future. "The outlook is most encouraging," he said, "and I look for a large fall business, with good priees. We don't want a boom, for they are only short-lived and do more harm than good, but a good steady trade. I travel a great deal, both north and south, and find that the railroads are everywhere doing a big business. That means a large demand for rails, steel cars, bridges, etc., and it is the same in other lines of trade. We find that conditions have already greatly improved and are receiving a large number of inquiries and orders. The situation seems to me thoroughly sound, and I am confident that we have a good year before us." In addition to his other duties, Mr. Zehnder has recently been elected a director of the Equitable Life Assurance Society, of New York as a representative of the policy-holders, and is taking an active interest in the rehabilitation of that much discussed company.

Hulett Automatic Ore Unloaders at Lorain, O.

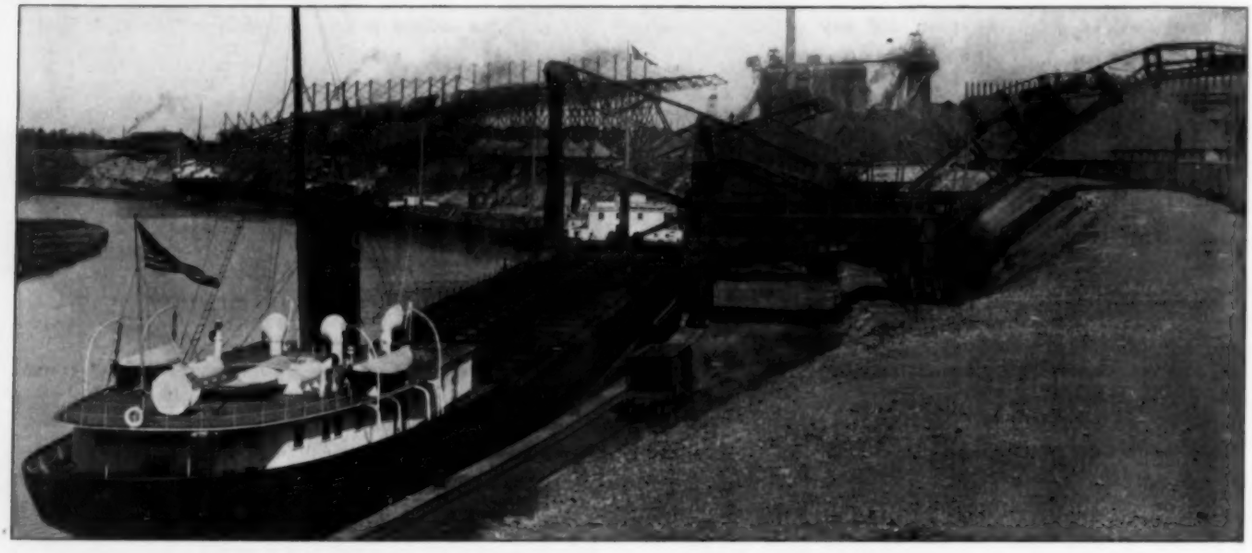
Readers of *The Iron Trade Review* have doubtless noted with interest previous descriptions of various installations of the Hulett automatic unloaders, invented by Mr. Geo. H. Hulett, third vice president of the Wellman-Seaver-Morgan Co., Cleveland, O., which is the sole builder of the machines. The accompanying illustrations represent the latest installation of these rapid unloaders, embodying a number of special features, largely necessitated by local conditions, and in a measure illustrating the adaptability of design permissible in these machines to meet special conditions which may obtain at various ports.



VIEW FROM RIVER OF THE HULETT AUTOMATIC ORE UNLOADERS AT LORAIN, OHIO.

The Lorain docks in front of the Hulett automatic ore unloaders are curved to such an extent that while the ends of a boat touch the dock, the boat at an intermediate point is 12 ft. away from the dock. Also the tracks on which the unloaders travel are correspondingly curved, hence some provision was necessary to enable the unloaders to be readily squared with any of the hatches of the boat. This is accomplished by mounting each machine on special swiveling trucks, thus enabling the leg and bucket to be easily squared with any of the hatches. The machines are provided with special cantilever extensions particularly designed for delivering the ore on a high bank back of the machine. It will also be noted that the walking beams of these machines are located at the top and the parallel bars below, an arrangement permitting of very advantageous distribution of the materials employed, and also simplifying the matter of counterbalancing.

The general operation of these machines is similar to that of previous installations. Each machine has two parallel girders at right angles to the face of the dock and mounted on moving trucks. On these girders a trolley or carriage travels back and forth carrying a long pivoted walking beam. On the front or water end of the walking beam is carried a vertical dependent leg to which is attached the bucket. This leg is always maintained in a vertical position. The operator who controls

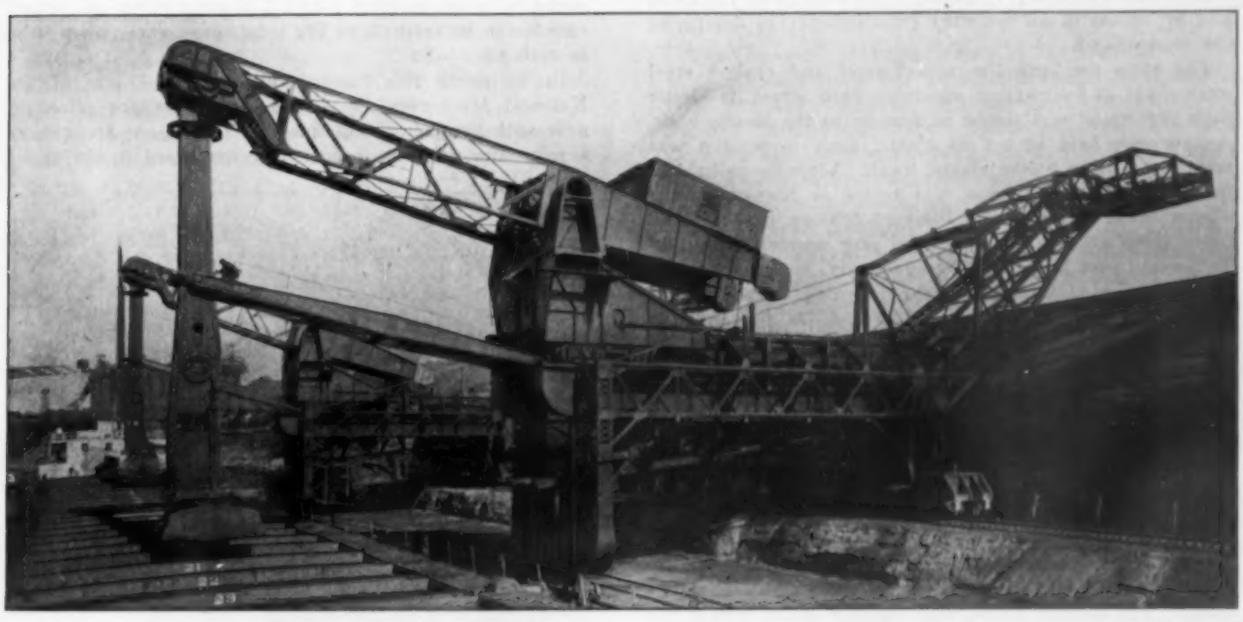


VIEW FROM SHORE OF THE HULETT AUTOMATIC ORE UNLOADERS AT LORAIN, OHIO.

all the motions of the bucket, rides at the lower end of the leg, directly above the bucket. By means of the hoisting mechanism, the walking beam is made to oscillate up and down carrying the bucket down into the hold of the boat and up above the dock. The travel of the trolley back and forth on the girders carries the walking beam and the bucket out over the boat and back over the dock.

To reduce the trolley travel as much as possible, suitable hoppers for receiving the contents of the bucket are mounted between the girders at the front. These hoppers discharge into an auxiliary bucket car which travels back and forth on the cantilever extensions, carrying the ore back and dumping it on the high bank above referred to.

The bucket car is automatic in its operation, dumping itself at any point desired on the cantilever and returning closed to its position under the hoppers ready to receive another load. The dependent leg of the unloader is located on rotating trunnions in the walking beam, so that it can rotate in a circle when operating in the hold of the vessel, allowing the bucket to reach out in all directions.



NEAR VIEW OF THE HULETT AUTOMATIC ORE UNLOADERS AT LOR AIN, OHIO.

The bucket is of 10 tons capacity, and is opened and closed by specially designed motors. The total spread of the bucket when wide open, is over 18 ft., and by telescopic motion can be made to reach, when open, more than half way from the center of one hatch to the center of the other. It also travels lengthways of the hatch to the sides of the boat, consequently the operator is able to reach almost the entire cargo. In an ordinary boat there is no difficulty in reaching 90 percent of the cargo, and in some of the modern boats, the machines have actually unloaded 97 percent without the aid of shovelers.

The Hulett automatic ore unloaders at Lorain, are electrically operated the power being supplied from motors which take their current through sliding contacts from rails laid along the dock. The motors for operating the bucket, are 110 h. p.; those for hoisting the walking beam are 150 h. p.; for trolleying in and out, 50 h. p., and for operating the bucket car and moving the machine, 150 h. p. Hoisting and trolleying are done simultaneously, speeds being figured to produce a round trip a minute. The controllers are of magnetic type, especially built for heavy service.

A NEW NICKEL PLATING PROCESS.

A new process for nickel plating without the use of electricity has been recently developed in France. The object to be plated is first cleaned in a wash composed of 11 pounds of potash dissolved in seven gallons of water. If the piece to be plated is rusted, it should be cleaned in a wash composed of two parts muriatic acid and one part water. The copper plating bath is formed by dissolving one-half a pound of sulphate of copper in seven gallons of water. Sulphuric acid is added to this until it becomes clear. The object to be plated is attached to a piece of zinc and suspended in this bath until it assumes a red color, when it is transferred to the nickeling bath. This is composed as follows: cream of tartar, 7 ounces; powdered sal ammoniac, 3½ ounces; common salt, 1¾ ounces; oxychlorhydrate of tin, 7 ounces; sulphate of nickel, single, 10 ounces; sulphate of nickel, double, 16 ounces. The pieces are to be removed from the bath and rubbed with fine sand on a moist rag, to get a brilliant deposit. Rubbing with a brass wire brush, or finishing on a buffing wheel will improve the appearance of the plating.

The engineering department of the city of Duluth, Minn., has issued a handsome booklet describing the new aerial ferry bridge recently erected across the ship canal at Duluth. The ferry is for the purpose of transferring passengers from the mainland to the island formed by the canal. It is the only one of its type in the world, and has just been completed. A copy of the book may be obtained by those interested from the engineering department, Duluth.

The roll department of the Geo. A. Hogg Iron & Steel Foundry Co., Pittsburg, Pa., is running day and night. Among its recent orders are two rolling mills with 16-in. x 72-in. rolls for rolling special material for the Abbe Engineering Co., of New York City; a 12-in. train of rolls complete for the Iron Co. of America; a 12-in. train and roll lathe for the Old Dominion Iron & Nail Co.; an 18-in. muck mill and engine for the Wilkes Rolling Mill Co., and a 60-in. motor-driven roll lathe for the National Tube Co.

COMBINED STRESSES ON THE ELASTIC PROPERTIES OF NICKEL STEEL AND CARBON STEEL.*

BY EDWARD L. HANNOCK.

A series of tests to determine the strength of different materials under combined stresses has been undertaken by the writer at the laboratory for testing materials, Purdue University. The tests reported are tests of steel bars in tension while under torsion. These were made by means of specially designed heads attached to an ordinary tension machine. The heads are ball-bearing and provided with spherical bearings to admit of the proper "lining-up" of the test piece. The specimen is held in each head by three wedges which move in the slots of three swinging lugs. This insures the proper holding of the specimen and admits of easy manipulation.

Long arms attached to one head, while the other was held stationary, gave a means of applying loads in torsion. While the test piece was held in torsion it was tested in tension to the elastic limit, readings being taken by means of an ordinary troptometer to determine the twist and by means of an ordinary extensometer to determine the elongations.

The tests on both the nickel steel and carbon steel were made as follows:: A specimen held at 1-3 its elastic limit in torsion was tested in tension to the elastic limit. A specimen held at 2-3 its elastic limit in torsion was tested in tension to the elastic limit. A specimen held at its elastic limit in torsion was tested in tension to the elastic limit. The elastic limit in tension in the three cases given above for nickel steel was lowered 7 percent, 21 percent and 63 percent, respectively, due to the load in torsion; for carbon steel the lowering of the elastic limit for three cases, was 6 percent, 30 percent and 54 percent, respectively, due to the load in torsion. The modulus of elasticity in tension was also lowered. These results were obtained by comparing with the results obtained from simple tension tests.

The specimens while being tested in torsion were held in tension under a load of 4,000 lb. per square inch. These tests in torsion compared with the results of simple torsion tests show that the elastic limit in torsion was lowered due to the tension load. A series of tests is planned to test metals in torsion while under tension.

A series is also planned to test metals under increasing tension and torsion loads, and another series where the material is tested in compression while under torsion.

When all the tests have been completed it is hoped that the validity of formulae used in the design of members subjected to combined stresses may be tested, and if not true more suitable ones substituted.

*Abstract of a paper read before the American Society for Testing Materials, at Atlantic City, N. J., June 29-July 1, 1905.

New Coal Field Discovered in Canada.

The northern outcrop of the Mullins seam near Lingan, about nine miles in a straight line from where the Cape Breton Coal, Iron & Railway Co. is operating at Broughton, has been uncovered. This discovery adds over 100 percent to the Dominion Coal Co.'s proved coal areas on land, and it will undoubtedly proceed with their development. The seam is known as the Mullins seam and has been lost to prospectors for upward of fifty years. It showed 6 ft. of clean coal, equal in quality to the coal of the Low Point areas, and its outcrop line will measure from 18 to 20 miles, extending from Lingan to Mira Bay, its greatest distance from the coast line being at Broughton, which is about 6 miles from here. This shows a land area of about 100 square miles, or 619,520,000 tons of coal. The seam is about 70 ft. from the surface, but this is only on the outcrop.

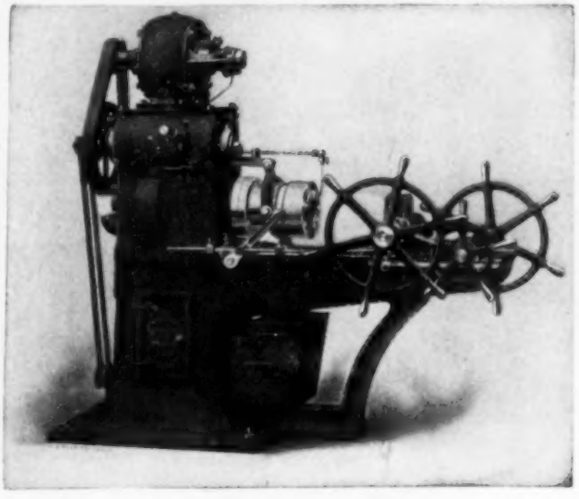
NEW BOLT THREADING MACHINE.

The National Machinery Co., of Tiffin, O., has placed upon the market a line of their bolt-threading machines, arranged for direct motor drive. Bolt-threading machines are frequently placed in forge shops or in isolated places, where it is difficult to convey power to them, and there is a general demand for direct motor-driven machines.

The accompanying illustration shows the method of applying the motor, and to provide a thoroughly flexible equipment, the National Machinery Co. has equipped their machines with a suitable speed change device so that the proper cutting speeds can be secured through the change gears even when the motor is of the constant speed type.

The illustration is of a machine of 1½-in. capacity, and the gearing in the speed box provides four changes of speed, enabling the machine to handle work of all sizes within its capacity at the proper cutting speed. It is not necessary to use a variable speed motor, but if the utmost refinement is wished, by using a motor having a speed variation of from 1 to 1.4, a great range of cutting speeds can be secured, as the total speed variation will be as 1 to 5.5.

In designing this line of machinery the aim of the National Machinery Co. has been to combine effectiveness with simplicity, and this result has been secured, as a minimum number of gears are employed in the speed



NEW BOLT THREADING MACHINE.

box, and all of the movements of the gears and the various speed changes are secured by the shifting of one hand lever only. The gears are of large size, and are of wide face, and there are no gears or pinions sliding on feathers, neither are prong clutches employed.

The illustration shows the motor connected to the speed box by a silent chain, but it is possible to furnish this equipment, using a raw hide idler, and a gear drive direct from the motor. By placing the motor over the head spindle of the machine the floor space is reduced to a minimum, and the motor is out of the way of oil and dirt, and in addition all of the driving gears are incased.

These machines are built in all sizes from 1 in. to 6 in. capacity, each size having a proper number of cutting speeds to handle the work for which it is designed.

The Indiana Foundry & Machine Co., South Bend, Ind., contemplates erecting an addition to its main foundry. Several smaller buildings will also be erected for general all round enlargement of the plant.

NEWS FROM MANY INDUSTRIES.

New Buyers :—

Syracuse Aluminum & Bronze Co., Syracuse, N. Y., to do a general foundry and machine business, has been incorporated with a capital of $25,000. The incorporators are: Willard C. Lipe, Alexander T. Brown and Willis Diefendorf, all of Syracuse, N. Y.

The National Propeller Co., of Philadelphia, has been granted a certificate of incorporation in Delaware to manufacture appliances for boats of any description. The capital is $130,000.

James L. Robertson & Sons, Inc., New York, has been incorporated with a capital of $75,000, to manufacture and deal in machinery, supplies, etc. The incorporators are: James L. Robertson, James L. Robertson Jr., and Frank Robertson, No. 54 St. Nicholas avenue, New York.

The Detroit Foundry Supply Co., Detroit, Mich., has been incorporated by Edward J. Woodison, Lorenzo A. Crandall, William F. Bartlet, W. Bruce Howard and John A. Preston. The capital stock is $25,000.

The Theo. Smith Mfg. Co., Chicago, has been incorporated with a capital of $250,000. The incorporators are: Theo. Smith, A. H. Wilson and H. L. Kraft. The concern will manufacture machinery.

The Aultman Engine & Thrasher Co., Cleveland, has been incorporated with a capital stock of $250,000, of which $6,250 is represented by property located in Wisconsin. A. R. Horn is secretary and treasurer.

The Beaver Machine Co., Cincinnati, has been incorporated with $7,500 capital stock. The incorporators are: N. B. Brant, John S. Francis, Engene Brunsman, Bernard Oppenheimer and J. H. Pillings.

The Marshalltown Drop Forge Co., Marshalltown, Iowa, has been incorporated to manufacture drop forgings and products of a similar nature. The capital stock of the company is $25,000. The directors are: C. R. Speers, G. A. Smith, E. E. Valentine, and the officers are: C. R Speers, president and treasurer; E. E. Valentine, vice president; G. A. Smith, secretary, and Ralph Smith, manager. The incorporators are: C. R. Speers, E. E. Valentine, J. R. Morris, G. A. Smith, W. A. Norton and H. R. Dodge.

The S. M. Jones Co., Toledo, O., has been incorporated to manufacture and sell oil-well machinery. The capital stock is $500,000, and the incorporators are: D. E. Jones, John S. Good, George Jay Rathbun.

The Stanton Mfg. Co., 14 East Westfield avenue, Union, N. J., has been incorporated to manufacture automobiles and parts thereof. The capital is $100,000, and the incorporators are: A. C. Stanton, Roselle Park, N. J.; Maxwell K. Willoughby and Frank Southmayd.

The Mill Machinery Manufacturers of Sandy Hill, Troy, N. Y., has been incorporated to make and sell foundry supplies. The capital stock is $10,000, and the directors are: William J. Gallagher, B. G. Higsbey, Sandy Hill; and Frank M. Chapman.

The Anderson Tool Co., Anderson, Ind., has been incorporated with a capital stock of $10,000. The directors are: Edward S. Lea, Clement W. Hooven, Chester G. Brown, Thomas N. Stilwell and Horace C. Stilwell.

The International Non-Explosive Tank Co., New York City, has been incorporated to manufacture non-explosive cans, tanks, etc. The capital is $250,000, and the incorporators are: Louis Kessler, Des Moines, Iowa; Chas. Frankenstyne, 14 East 111th street, New York city; John S. Taylor, New Rochelle; Samuel Frankenstyne, 14 East 111th street, New York City, and Philip J. Levi, 141 West 142d street, New York city.

Deluge Pump & Manufacturing Co. is being organized at Ottawa, Ill., with a capital stock of $15,000 to manufacture pumps and implements. William A. Moloney, E. J. Feeney, E. J. Graham are the incorporators.

The French government is in the market for 1,400 tons of pig iron. Specifications may be obtained from La Direction de la Chaussade, Guerigny, France.

The Acme Metal & Machine Co., Fort Worth, Texas, has been incorporated with a capital stock of $20,000. The incorporators are: H. J. Bryant, Frank B. Lantery, Chas. E. Bowman and William R. Booth.

The Forest City Motor Car Co., Cleveland, has been incorporated with a capital of $50,000. The incorporators are: W. E. Stone, G. J. Wertz, Philip Lehr, Charles J. Eby and Frank R. Wall, all of Cleveland. The new concern is to make motor cars of all descriptions.

The Henning Mfg. Co., Minneapolis, Minn., has been incorporated with a capital stock of $100,000. It will manufacture metal and other cornices, fireproof doors and other construction, roofing, etc. The incorporators are: Julius and Chas. Henning, Orvar G. Rosing, E. G. Potter and W. G. Nye.

The Universal Machine Screw Co. has been incorporated in Hartford, Conn. The authorized capital stock is $100,000, and the company will commence business with $50,000. It will manufacture machine screws. The incorporators are Christopher M. Spencer, Windsor; Reinhold Hakewessell, Hartford; Charles Phelps and George E. Sykes, Rockville; Frederick A. Betts, of Hartford.

The Jaynes Automobile Co., Buffalo, N. Y., capital, $100,000, will manufacture automobiles, motor boats, etc. The incorporators are: Wellington C. Jaynes, Buffalo; Frank I. Alliger, Tonawanda; Comus B. Penney, North Tonawanda, N. Y.

The Efandem Co., New York, has been organized to manufacture machines and devices. The capital is $50,000 and the incorporators are: Wilhelm J. Fahn and Paul McJunkin, No. 201 East Sixteenth street, New York, and Lida K. McJunkin, No. 17 Livingston Place, New York.

The Universal Manufacturing Co., Boston, has been incorporated to promote patents. The incorporators are: President, George M. Faulkener; treasurer, Frank Foss; clerk, G. Rampolli, all of No. 170 Sumner street, Boston, Mass. The capital named is $100,000.

The M. H. Brigham Co., Boston, has taken out articles of incorporation. The purpose of the company is to manufacture machinery. The capital is $10,000. The incorporators are: Charles C. Stanchfield, president; Melvil W. Brigham, treasurer; Walter J. Lowder, clerk; all of No. 63 Haverhill, Boston.

Fires :—

An explosion in the foundry of the Hart & Crouse Co., Utica, N. Y., on July 25, injured five of the workmen. The explosion took place in the cupola and the cause has not been explained.

The slight fire resulting from the bursting of the big fly wheel of the Maryland rail mill, Cumberland, Md., added to the damage incurred from the flying pieces of the wheel, wrecked that mill and injured several workmen.

The Wenona mine, engine and boiler houses, Bay City, Mich., were totally destroyed by fire recently, causing a loss of $35,000. The battery of five new boilers, two new Norwalk air compressor plants, and the 1,000-ton hoisting engine were totally ruined. About $20,000 insurance was carried and the plant will be rebuilt at once.

The Allard Iron Works, Sandy Hill, N. J., was destroyed by fire last week, entailing a loss of $5,000. The

plant was built in 1780 by Allijah Jones and was used as a woolen mill until 1844, since which time it has been operated as an iron foundry. There was no insurance.

New Construction:—

The Standard Wire Fence Co., Ltd., Woodstock, Ont., intends erecting a $10,000 building on the new site it has purchased in that city. Awaiting the erection of its own plant, a building has been rented for use as a machine shop.

The new buildings of the Chicago Hardware Foundry Co., North Chicago, are nearly completed. They include one building 100 x 80 ft. two stories high, to be used as stock and shipping room, another building 100 x 40 ft., one story high with a loft, to be used half as a carpenter shop and half for a store room, and a flask shed 16 x 300 ft., one story high. The first mentioned buildings are of brick and iron construction and the other of wood. Its machinery and construction material has already been purchased.

The new foundry at West Bainbridge, Ga., controlled by D. T. Sutherland, mentioned in our issue of July 20, is to include a machine shop 50 x 50 ft., pattern shop 25 x 50 ft., boiler and engine room 40 x 50 ft., all of iron and brick. Orders for the new engine and boiler, boiler and feed pump, heater and various machine shop tools will be placed in the near future. The building material has already been placed.

The Goodell-Pratt Co., Greenfield, Mass., is erecting a fire-proof building to accommodate its tempering, japanning, nickeling and wood-working departments. The structure is built of cement re-enforced with twisted steel rods, the window frames being constructed of galvanized iron. The window sashes are also of galvanized iron and the glass is wire glass. The floors, walls and roof are entirely of cement.

The Veitch Foundry & Machine Works at Bessemer, Ala., will erect a number of buildings, the first one of which, for immediate use, will be 30 x 75 ft.

The Scranton Steam Pump Co., Scranton, Pa., is building a new steel foundry 280 ft. long by 60 ft. wide with a wing 120 x 60 ft. The building will be equipped with electric cranes, air molding machines and all modern foundry equipments.

At a meeting of the directors of the West-Allis Malleable Iron & Chain Belt Co., Milwaukee, the old officers were re-elected and it was definitely decided to proceed with the new construction contemplated. The addition to the foundry will be 70 x 220 ft. and the addition to the machine shop 70 x 64, two stories in height. The new machinery will cost $3,000, and has been purchased. The enlarged plant will employ in the neighborhood of 400 men.

The Peerless Motor Car Co., Cleveland, mention of which was made in the issue of July 13, has let the contract for a building to be erected at its new plant, between Quincy and Oakdale streets and the Nickel Plate railway. The contract has been let to Skeel Bros., and will amount to about $20,000.

The Osborn Engineering Co., Cleveland, has awarded the contracts for a seven-story warehouse to be erected in Pittsburg for Haugh & Keenan. The building will be of steel frame, fireproof construction, and will cost about $100,000.

The Empire Plow Co., Cleveland, is erecting new buildings on Tod street. They will be 28 x 80 ft., 22 x 100 ft. and 81 x 60 ft. in size. H. A. Watterson has the contract.

General Industrial Notes:—

By order of Judge John R. Hazel, of the United States court, the Lancaster Malleable Iron Works, Lancaster, N. Y., was sold to the American Brake Shoe & Foundry Co., for $80,000.

The Knoxville Iron Co., Knoxville, Tenn., resumed operations and is running on full time after the shut down of ten days for repairs and inventory.

At the annual meeting of the Indiana Foundry & Machine Co., South Bend, Ind., the following officers and directors were elected for the ensuing year: directors, F. L. Dennis, Joseph Bergan, W. N. Bergan, A. A. Forsyth and C. W. Fassett. The president is C. W. Fassett; vice president, Joseph Bergan, and secretary and treasurer, Max Konzen.

The Crawford Rolling Mills, Terre Haute, Ind., for years known as the "North" and "South" iron mills, have been sold and dismantled. The iron and steel fittings of the plant are being converted into junk.

The Bond Foundry & Machine Co., Philadelphia, to be chartered under the state laws of Pennsylvania for the purpose of manufacturing the Bond hangers, post-hangers, pillow blocks and other power transmitting specialties, is to be incorporated to take care of the power transmission end of the business of Chas. Bond. The general supply business will be carried on as heretofore, and although some machinery may be required in the course of two or three months, the new company is sufficiently equipped with both buildings and machinery for its present needs.

The contract for the erection of the main building of the plant of the Sheffield Cast Iron Pipe & Foundry Co., Sheffield, Ala., has been awarded to the American Bridge Co., of Pittsburg.

The National Tube Co. has ordered the tearing out of the old blooming mill engine at its Riverside department at Benwood, W. Va.

The Pressed Steel Car Co., Pittsburg, received orders for 3,100 cars last week.

The three pipe shops of the Camden Iron Works, Camden, N. J., were closed down recently on account of the excessive heat.

The Leighton & Howard Iron Co., of the American Steel Foundries at East St. Louis, has been closed down for an indefinite period.

It is intended to resume operations at the plant of the Newport rolling mills, Newport, Ky., this week.

The South Chester Tube Co., South Chester, Pa., started at the beginning of the month after an idleness of some time.

The Atlas Engineering Works, Indianapolis, Ind., hopes to gain the city's consent to the laying of private railroad tracks for use between the different plants of its establishment.

The McKiernan Rock Drill Co., of New York, with a factory at Dover, N. J., will probably be purchased and absorbed by the Chicago Pneumatic Tool Co., as that company has secured an option on the plant.

The Brown & Sharpe Mfg. Co., Providence, R. I., announces its annual vacation period Aug. 4 to 18.

The Youngstown Foundry & Machine Co., at its recent annual meeting, elected the following officers and directors: President, Thomas Parrock; vice president, T. B. Van Alstine; secretary and treasurer, F. A. Williams. These, together with M. J. Wallis, Geo. E. Rose, M. E. Coombs and E. B. Lawrence make up the board of directors.

The last monthly meeting of the Steam Founders' Society of America was held at the Hotel Cadillac, Detroit, July 19. Representatives of steel manufacturers from New York, Chicago, Philadelphia, Pittsburg, and elsewhere, were among those present.

A WORD ABOUT IRON

"Where can we get **GOOD IRON** such as we formerly used?" This question is often asked these days when so many mills are rolling steel exclusively, and so many others are making inferior iron. We wish to call your attention to the fact that we devote ourselves specially to the manufacture of **IRON OF SUPERIOR QUALITY AND FINISH,** which we guarantee to give satisfaction.

SQUARE ROOT and FILLET IRON & STEEL ANGLES

HEXAGON IRON and STEEL, ⅜ to 3 inches

LOCKHART IRON & STEEL CO. PITTSBURG, PA.

LIGHT POWERFUL EFFECTIVE

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FOR SHOP AND FOUNDRY

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THE **INGERSOLL-SERGEANT** DRILL CO.

Boston, Mass. Pittsburg, Pa. Philadelphia, Pa.

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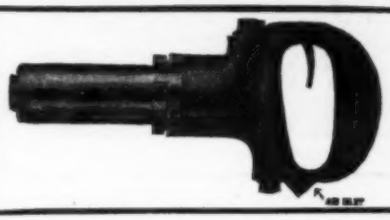

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ARE UNEQUALED

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High Grade Tempers Guaranteed

Rolling Mills **HARROW SPRING COMPANY, Kalamazoo, Michigan** Spring Works

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IF YOU BUILD MACHINERY YOU HAVE THEM

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of every description to your order from your specifications. Wouldn't it be a good thing to write us for prices and see what we can do for you. Better do it to-day.

TROPENAS CONVERTER STEEL PROCESS

With one 2-Ton Converter, makes Castings from 1 oz. to 13,000 lbs.

AVERAGE OF 22 TESTS MADE BY U. S. GOVERNMENT.

Sulphur .035%, Ph. .045%.
Elastic Limit 34374. Tens. Strength 67722.
Elongation 33,36%. Reduct. of Area 46,4%.
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20 PLANTS ERECTED IN U. S. AND CANADA.

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Your Good Common Sense

Does the rest when once you come to know the Ridgway Steam Hydraulic.

People all over the world are finding out a thing or two about the Steam Hydraulic, and the consequence is that with us it is no longer a question of getting orders, but of getting them made fast enough to keep folks sweet.

We have a most splendid thing in the elevator way—just what has long been wanted—and we want you to know about it.

Circulars are all right if anybody would take time to wade through them, but the best way to know the steam hydraulic is to come here or go elsewhere and see one at work and so know all about them for yourself.

We have hundreds in use all over the land, in all kinds of plants and you can easily find out what it means to

"Hook 'er to the Biler."

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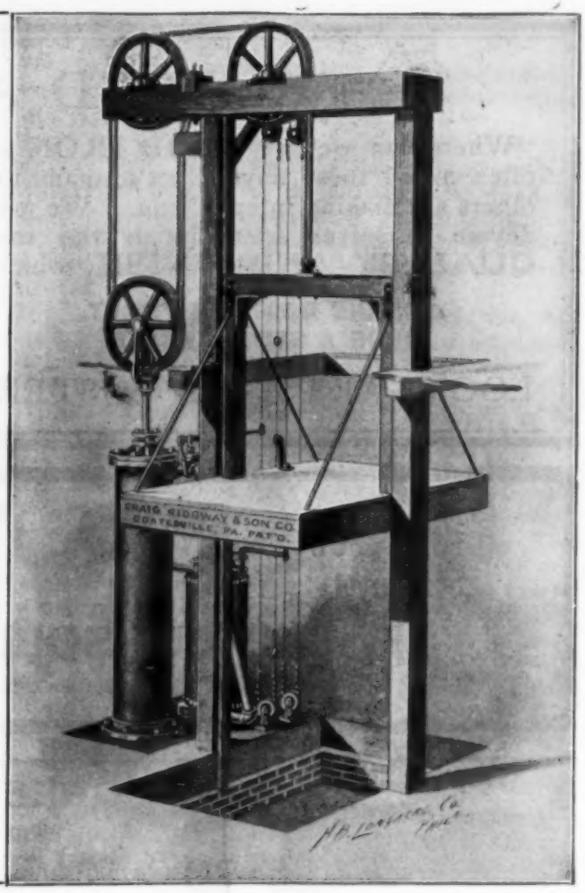

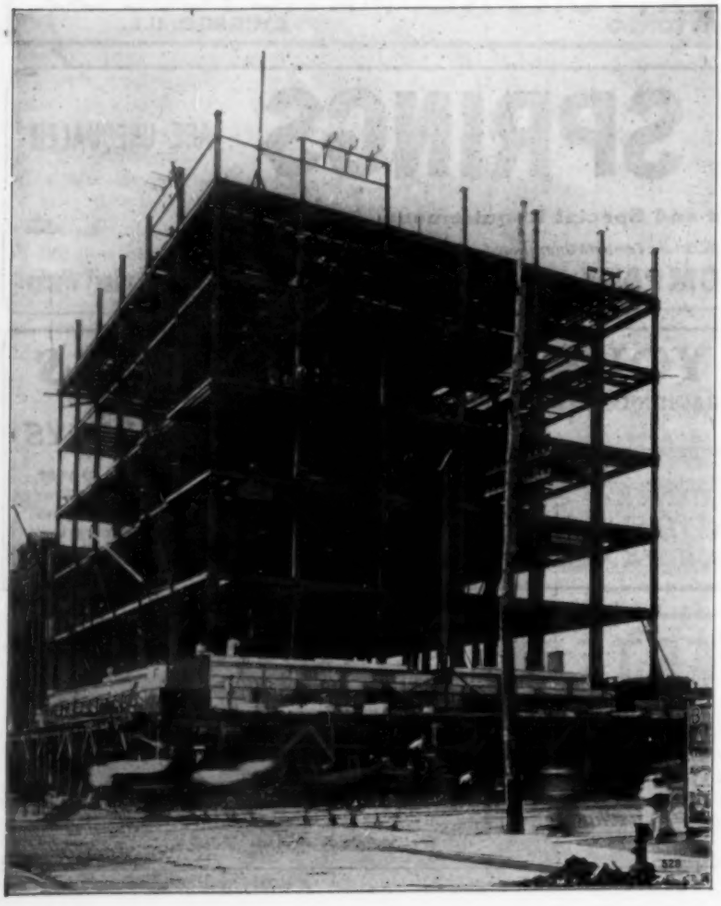

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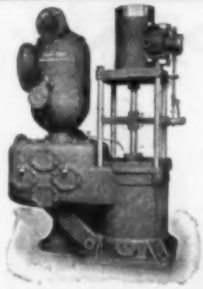

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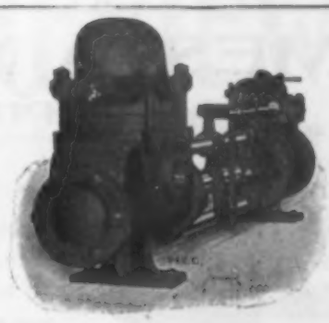
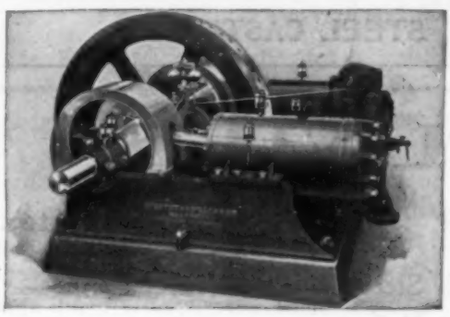


Simple Steam Pump.



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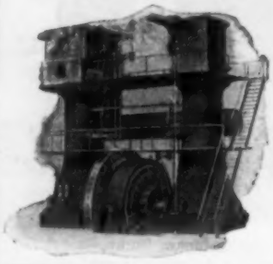

Vertical Cross-Compound Corliss Engine

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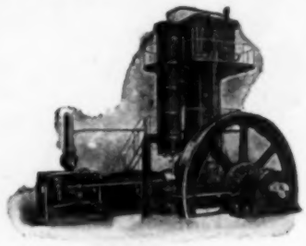

Horizontal-Vertical Compound Engine

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